The Gill Net Fisheries of Nomozaki Town Fisheries Cooperative Association
(with Reference to the Current Situation and the Future Outlook)

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The gill net is one of the most popular fishing gear that is basic to fishermen of various ages groups, cultures and socioeconomic standards. In the case of Japan the gill net fishery is rural based whereby artisanal fishermen of various village level fisheries cooperatives are engaged into pursue their economic endeavors. The economic existence of the fishery nowadays depends on limited available resources which without sound management would jeopardize the fishery and the livelihood of the fishermen as a result. The Nomozaki Town Fisheries Cooperative Association is a typical example whose management measures have included legislations for the rational utilization of the resources and at the same time bearing the financial burden of restocking and artificial reef development. A brief look back to the past catch-revenue performances and the present situation has provided a reference to conclude that the fishing ground development and restocking will have to continue in order to maintain the general upward trend of catch and revenue it has experienced over the years.

Key words: Gill net, Fishery, Cooperative, Management, Resources, Catch, Revenue.

Introduction

The gill net is one of the most widely used fishing gear in the Fishery Cooperatives throughout Japan. Over the long history of its application by simple artisanal cooperative members, the gill net fishery prospered under cooperative guidance and has served the operators well as a basic fishing gear. Besides its long history a number of reasons as to why the gear has persisted over many years and is still common among different levels of fishermen is given here as thus;

1. It requires relatively minimum capital investment,
2. Maintenance cost of the gear and operating cost of the fishery is minimum,
3. Easy physical application and maintenance,
4. Affordable by members of a wide socioeconomic spectrum.

These features of the gill net fishery therefore eases or otherwise eliminates the usual socioeconomic problems such as lack of education and experience, inadequate capital base and such intrinsic physical factors as age and sex.

The Nomozaki Town Fisheries Cooperative Association is a typical fishery cooperative situated some 25 km South of Nagasaki city. With a membership of 720 (Annual Report of Nomozaki Town Fisheries Cooperative Association, 1988) fishermen the cooperative association is engaged in a variety of fishery activities ranging from fish culture to net fisheries, pole and line, angling and to on. The Fishery Cooperative's Common fishing right zone spreads all around the Nomo point and is subdivided into 4 sea areas. A common fishing ground has been allocated separately for gill net
fishing by all the fishermen involved in the fishery. The gill net fishing season begins from August and continues on to March of the next year. Fishing is done during the night targeting mainly spiny lobster, flying fish, flounder and other coastal species.

Aim

As planning and management of businesses demand an understanding of the development trends, it is essential to refer to the historical events with the attempt to recognize the subsequent trends that lead up to the current situation. Thus, it is from the current standpoint that future development plans and management maneuvers can be established. For this matter this study was carried out on the gill net fishery of Nomozaki.

Procedure

Questionnaires concerning individual gill net fishermen’s fishing activities and returns in terms of catch and income were handed to the Nomozaki Town Fisheries Cooperative Association's central office from which the necessary information were obtained. Following this, additional information were sought through interviews. As it is time consuming and inconvenient on the side of the fishermen to conduct individual interviews, all the information were obtained via the office of the Cooperative on their behalf. Other relevant information were sought from periodicals.

Out of a total number of 62 fishermen engaged in gill net fishing a random sample of 31 (50%) fishermen from three different sea areas of the same Cooperative’s jurisdictional area was obtained.

Limitations

Due to the unavailability of much of the historical data needed, catch trend from 1978 is hereby emphasized upon. The latest available data is that of 1988 which was used to describe the present situation in a little more detail.

Historical situation

Although every development stage is coupled with its own specific problems, the initial phase of the gill net fishery felt no major concerns about the availability of fishery resources. Catches have been on the rise over the years during which the fishery suffered a decline in catchable stocks.

Figure 1: Annual gill net catch volume and revenue from 1978 to 1988.
of the major target species. To overcome this decline, the Cooperative embarked on a restocking program of the lobster which began in 1976 under the joint funding of the Cooperative, the Local Government and the gill net fishermen by a one-third share each, totaling 1,080,000 yen. Further fishing ground enhancing involved artificial reef development for lobster aggregation which is also jointly funded costing the partners up to a total of 143,414,000 yen from 1978 to 1988 (Nomozaki Town Fisheries Cooperative Association Annual report, 1988).

The directly related labor force was somewhat stable from 1978 and onwards lingering around sixty members. However, since the major target species are shared with other fisheries there has been a somewhat rise in the intensity of pressure on the available catchable stocks. Despite fluctuations along the way catch volumes

![Graph 2: Historical catch trend from 1978 to 1988.](image)

![Graph 3: Historical revenue trend from 1978 to 1988.](image)
Table 1: The comparative movements of catch, revenue and marketing cost from the base year of 1978. Units: kg; 1,000 Yen

<table>
<thead>
<tr>
<th>Year</th>
<th>Catch</th>
<th>%age</th>
<th>Revenue</th>
<th>%age</th>
<th>Marketing</th>
<th>%age</th>
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</thead>
<tbody>
<tr>
<td>1978</td>
<td>39496</td>
<td>100</td>
<td>102596</td>
<td>100</td>
<td>4008</td>
<td>100</td>
</tr>
<tr>
<td>1979</td>
<td>35664</td>
<td>90</td>
<td>91504</td>
<td>89</td>
<td>3605</td>
<td>90</td>
</tr>
<tr>
<td>1980</td>
<td>44352</td>
<td>112</td>
<td>110125</td>
<td>107</td>
<td>4269</td>
<td>94</td>
</tr>
<tr>
<td>1981</td>
<td>43702</td>
<td>111</td>
<td>102714</td>
<td>100</td>
<td>4007</td>
<td>90</td>
</tr>
<tr>
<td>1982</td>
<td>39772</td>
<td>101</td>
<td>94840</td>
<td>92</td>
<td>3664</td>
<td>91</td>
</tr>
<tr>
<td>1983</td>
<td>48851</td>
<td>124</td>
<td>105307</td>
<td>103</td>
<td>4047</td>
<td>101</td>
</tr>
<tr>
<td>1984</td>
<td>64358</td>
<td>163</td>
<td>124678</td>
<td>122</td>
<td>4777</td>
<td>119</td>
</tr>
<tr>
<td>1985</td>
<td>54351</td>
<td>138</td>
<td>119309</td>
<td>116</td>
<td>4629</td>
<td>116</td>
</tr>
<tr>
<td>1986</td>
<td>70699</td>
<td>179</td>
<td>137614</td>
<td>134</td>
<td>5307</td>
<td>132</td>
</tr>
<tr>
<td>1987</td>
<td>74305</td>
<td>188</td>
<td>122313</td>
<td>119</td>
<td>4632</td>
<td>116</td>
</tr>
<tr>
<td>1988</td>
<td>76800</td>
<td>195</td>
<td>125167</td>
<td>122</td>
<td></td>
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</tr>
</tbody>
</table>

and returns over a 10 year period from 1978 to 1988 have shown a general upward trend as shown below in Figure 1.

Time series trend analysis by least square method of the catch and revenue from 1978 to 1988 hereunder provides a reference for estimating the future catch levels provided there will be no drastic changes along the way.

Present situation

There are 62 directly related households involved in gillnet fishing which makes the fishery the second largest after the pole and line fishery in terms of membership. Ages of fishermen in the sample of 31 members range from the 30s to 60s as shown in Table 2.

For the purpose of resource management, the Nomozaki Fisheries Cooperative Association in a general meeting decided certain regulatory measures that cater for the rational harvesting of the resources. Such existing measures include the following:

a. Mesh size determination .... 2.5 sun (3cm).

b. No. of sets of nets ............... 20 sets.

c. Harvestable size of lobster

............... not <15cm carapace length.

d. Depth of nets ................... 5~7 metres.

e. Fishing season ................. August~May.

Table 2: The sampled manpower component of the gill net fishery.

<table>
<thead>
<tr>
<th>Age group</th>
<th>No. of persons</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 s</td>
<td>3</td>
</tr>
<tr>
<td>40 s</td>
<td>5</td>
</tr>
<tr>
<td>50 s</td>
<td>16</td>
</tr>
<tr>
<td>60 s</td>
<td>7</td>
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</table>

From the random sample obtained from the Cooperative, the manpower component of the fishery is hereunder stratified in terms of age for the purpose of showing the level of participation by different age groups.

The above membership pattern of the gill net fishery is typical not only in the gill net fishery of Nomozaki, but also in the other Fishery Cooperatives around the neighborhood.

Age as a determinant of performance is hereby referred to, to represent the various facts about the gill net fishermen of Nomozaki Town Fisheries Cooperative Association (Table 8).

Note:1. Depreciation costs of fiber reinforcement plastic (FRP) boats were calculated using the straight line depreciation method from the day of purchase to
Table 3: Description of the features of the gill net fishery of that of 1988 based on the various age groups.

<table>
<thead>
<tr>
<th>Age groups</th>
<th>a, Physical Factors</th>
<th>Family size</th>
<th>Experience (yrs.)</th>
<th>Work days/yr.</th>
<th>Labor/day</th>
<th>Net soaking hrs.</th>
<th>Boat tonnage</th>
<th>Catch (ton)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 s</td>
<td>4.3</td>
<td>17.3</td>
<td>216.7</td>
<td>2.3</td>
<td>14</td>
<td>4.9</td>
<td>1.8</td>
<td></td>
</tr>
<tr>
<td>40 s</td>
<td>3.8</td>
<td>22.2</td>
<td>206</td>
<td>2.4</td>
<td>12.4</td>
<td>2.4</td>
<td>1.4</td>
<td></td>
</tr>
<tr>
<td>50 s</td>
<td>3.3</td>
<td>29.7</td>
<td>222.5</td>
<td>2</td>
<td>11.9</td>
<td>3.6</td>
<td>2.9</td>
<td></td>
</tr>
<tr>
<td>60 s</td>
<td>3</td>
<td>32.3</td>
<td>211.4</td>
<td>2.7</td>
<td>11.9</td>
<td>2.6</td>
<td>2.5</td>
<td></td>
</tr>
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</table>

b, Economic Factors
Unit: 1000 Yen

<table>
<thead>
<tr>
<th></th>
<th>Investment</th>
<th>Total fixed cost</th>
<th>Total variable cost</th>
<th>Catch value</th>
<th>*B. E. P (sales volume)</th>
<th>B. E. P (catch (ton))</th>
<th>safety margin</th>
<th>Catch value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10969</td>
<td>1680</td>
<td>488</td>
<td>4507</td>
<td>1884</td>
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<td></td>
<td>2096</td>
<td>1077</td>
<td>314</td>
<td>2550</td>
<td>1228</td>
<td>1.08</td>
<td>1322</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2846</td>
<td>1049</td>
<td>394</td>
<td>4207</td>
<td>1157</td>
<td>1.05</td>
<td>3050</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3541</td>
<td>1120</td>
<td>438</td>
<td>4870</td>
<td>1123</td>
<td>1.12</td>
<td>3747</td>
<td></td>
</tr>
</tbody>
</table>

c, %age of involvement in other fisheries

August 1988. The FRP vessels below 20 tons are given 10 years life time under the National tax law.

2. Other gear like the net hauler and navigational aids whose date of purchase were not known were deemed to have used up half of their 6 year life time.

3. The nets have an official life time of 3 years. However, they are usually replaced annually for the sake of efficiency.

Besides gill net fishing a total of 21 fishermen in the sample are also involved in other fisheries activities as there are no provisions restricting them from doing so. Shown below in Table 2 are the specific type of fisheries and the degree of involvement by the gill net-major fishermen.

Note: While all the rest of the fishermen in the sample major gill net fishing, 3 fishermen from the 50 year old group are involved on part time basis while majoring in set net fisheries.

Discussion

Events from the past that lead up to the recent time experienced a period of changes in terms of the pattern of catch-revenue relations. The irregular pattern was due to catch fluctuations for most of the year until 1987 when revenue obviously dropped against an increasing catch (Table 1.). The following year saw a further
increase in catch as well as a slight increase in revenue.

Besides the management measures imposed by the Cooperative standardizing mesh size, number of sets of nets, harvestable size of major target species, depth of nets and seasons, the somewhat steady gill net catches from 1978 to 1988 and the fact that there is fishing ground development and restocking going on, the extreme effects of resource instability on the fishery has been ruled out.

According to Table 3, the residing family members appears to have decreased with age as it is understandable that the children are grown and independent. Experience of course increases with age in most cases although it actually depends on the actual length of time spent on the fishery. Work days per year and the number of labor per day did not show any particular trend due largely to the fishermen's personal daily routine and the scale of ones own fishery operation. Labor however, is largely husband and wife team. There was no report of employed or hired labor as the fishery is strictly small scale. Soaking hours of the nets or the time between shooting and hauling of the nets did not show any significant difference for consideration. Boat tonnage also barely showed any trend of interest for the reason that tonnage determination was not based on gill net fishing alone, but also on other fisheries activities the fishermen engage in for the purpose of making economic ends meet. This applies mostly to the younger energetic fishermen.

Concerning the economic factors, it appears the younger fishermen have a relatively larger investment and likewise run at a higher cost than the older ones. However, returns from the investments are reversed but not significantly different and does not represent the actual income of the age groups. This is attributed to the fact that unlike the younger fishermen the older fishermen mostly concentrate on gill net fishing alone.

Break-even point for sales volume in tonnage and monetary terms point out the fact that the younger fishermen need a higher output to cover costs. This is further suggested by the safety margin which indicates safer economic positions on the side of the older fishermen.

Family obligations have a way to determine the scale of the household business activities identified here as the major factor that differentiates production levels among the age groups. In this case the older fishermen with smaller resident family membership deliberately may have scaled down their input and output equilibrium while the younger counterparts with bigger families opted for higher and varied business activities.

The current development stage is accompanied by a number of problems the Cooperative Management is facing. Faced with the concept of common property resource and the fact underlying poor fishing gear selectivity, mobile stocks of the flounder species have been shared with other fisheries. This is a major dilemma for which there is almost no immediate solution. Another problem that has somewhat developed a steady trend in the recent years is the fact concerning the decreasing rate of replacement of the retired fishermen. This has been the case in the general gill net fisheries of Nagasaki Prefecture. The trend from 1983 to 1988 shows a 1.4% decline in the number of direct gill net fishermen and a 4.6% increase in part-time gill net fishing (The movement of fisheries of Nagasaki Prefecture, 1988).

Future outlook

a. Labor situation:

Given the current age composition of the labor force and the fact concerning the declining rate of recruitment into the direct gill net fishery and an increasing rate of part-time fishing, it is obvious that the fishery will most likely become a
secondary resort for restoring one's economic safety. However, the possibility of the fishery being abounded is not possible as the returns from the catch of lobster is quite attractive. It is the highly valued lobster (10,000 Yen per kg for live lobster) that is perceived to be the main factor guaranteeing the economic existence of the gill net fishery.

b. Economic situation:

The predictions of revenue from sales of catch cannot be stressed due to its low predictability hampered by vigorous periodic fluctuations. Since the management system in the past and that of the present are the same the irregularities of catch and revenue will be caused by factors that are beyond the control of the Cooperative and are likely to continue at more or less the similar pace. Therefore, the household fishermen's socioeconomic positions will shift likewise, but will generally improve in the future provided catch-revenue relations remain closely maintained.

c. Resource situation:

As the gill net is a stationary gear it is vulnerable to resource fluctuations. With the increasing pressure on the major target species (lobster and flounder) the Cooperative and its financing partners have been and should continue to bear the burden of monitoring the resources, improving and restocking the fishing ground.

Acknowledgements

We hereby wish to extend our sincere gratitude to Mr. Hayata of the Nomozaki Town Fisheries Cooperative Association for providing us with information on behalf of the members of the gill net fisheries and all those who helped one way or another. To Mr. S. Hirai we are very grateful for his help in data collections.

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野母崎町漁業協同組合の刺網漁業
（現状と将来について）

テレンス ヤメル・八木 庸夫

刺網は最も普及している漁具の一つで、様々な年齢、文化、社会経済的水準の漁業者の基礎となっている。日本の刺網漁業は、経済的効力を行っている異なるレベルの漁業者の多様性によって漁村に根付いている。今日では、刺網漁業の経済的な存在は制限された有効な資源に依存される。そこでなければ、水産業や漁業者の暮らしを危険に陥されることになる。

野母崎町漁業協同組合は、資源の合理的な利用のための法規作成及び栽培漁業や人工魚礁開発の財政負担を行っている典型的な事例である。

ここ数年間の漁獲高と水揚げ金額の動向と現状は、漁獲高と水揚げ金額の一般的な上昇傾向を維持するために続けられている漁場開発や栽培漁業の推進に結論づけられる。