

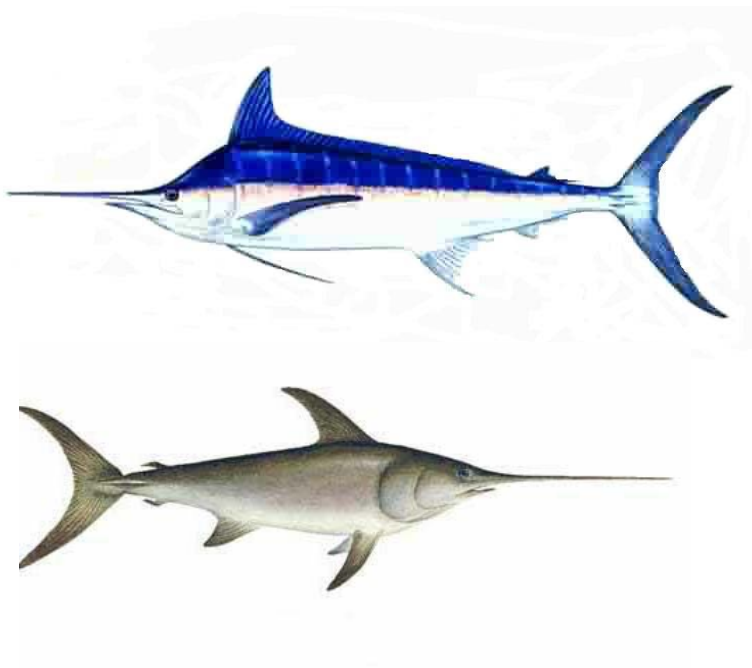


ISC/09/BILLWG-1/11

An Overview of the Economics and Operations of the Off-Shore Longline Fishery for Swordfish in Kesen-numa, Japan

Gakushi Ishimura
Centre for Sustainability Science
Hokkaido University
Kita 9 Nishi 8 Kita-ku, Sapporo, Hokkaido 060-0809, Japan

Kotaro Yokawa
National Research Institute of Far Seas Fisheries
5-7-1 Orido, Shimizu-ku, Shizuoka 424-8633, Japan



Introduction

Swordfish (*Xiphias gladius*) is one of the most economically valuable billfish species in the North Pacific, for both commercial and recreational fisheries. Target (direct) commercial fisheries of swordfish, however are operated in a limited area.

Kesen-numa City, which is located in the northern part of Honsyu Island, is the principal port for swordfish landings in Japan¹, taking around 80% of the total annual landings. In 2006, the port of Kesen-numa received 5,150 MT of swordfish which was worth \$42,118,240 USD and made up 19.7% of the total annual landing values at the port of Kesen-numa.

Currently three types of fisheries are engaging in direct swordfish harvest in Kesen-numa, 1) off-shore longline, 2) coastal drift net, and 3) harpoon fisheries. Around 75% of swordfish are landed by the off-shore longline fishery (Kesen-numa City, 2005). While coastal drift net and harpoon fisheries have limited mobility due to the relatively small size of vessels (less than 20 MT), off-shore longline vessels have large holding capacities (all vessels 119 MT) and extending operations east of the day change line. This paper focuses on the off-shore longline fishery and leaves overviews of coastal drift net and harpoon fisheries for future works.

Longline fisheries in Japan are licensed commercial fisheries authorized by the Ministry of Agriculture, Forestry and Fishery, and have two categories, 1) distant water (*enyou*) and 2) off-shore (*kinaki*). These categories simply represent holding capacities rather than the distances of fishing operations from shore. Distant water longline fishing vessels have a capacity equal to or greater than 120 MT, and off-shore longline fishing vessels have a capacity of less than 120 MT. In Kesen-numa, almost all off-shore longline fishing vessels actively operating have capacities of 119 MT, which is close to the maximum capacity of the off-shore category.

Ishimura and Yokawa (2008) presented a preliminary economic overview of the swordfish longline fisheries in Kesen-numa. Our purpose in this paper is to compliment the above paper and combined, provide a descriptive overview of the economics and operations of the swordfish longline fishery in Kesen-numa City.

¹ Pers. comm.

1. Back ground of the off-shore longline fishery in Kesen-numa

Since 1963, the off-shore longline fishery has been licensed by the Ministry of Agriculture, Forestry and Fishery. In Kesen-numa in 1963, 119 off-shore longline vessels with 50 MT holding capacities were converted from pollock and salmon longline fisheries in Northern Hokkaido, and were authorized for tuna and skipjack fisheries. The legal limit on the holding capacity of an off-shore longline fishing vessel was expanded to 80 MT in 1972, and additional expansion came with legalized holding capacities of 120 MT in 1982. Most of the existing off-shore longline vessels have a 119 MT holding capacity, tracking this 120 MT holding capacity limitation (Kesen-numa City, 2005).

The number of off-shore longline vessels in Miyagi prefecture in which Kesen-numa is located was influenced by these expansions of legal capacity over time, and registered off-shore longline fishing vessels in Miyagi Prefecture peaked in number to 170 in 1977. The depletion of tuna resources and rapid rise of fuel prices led to a decrease in the number of off-shore longline vessels to 26² in 2004. Twenty-four out of 26 off-shore longline vessels in Miyagi Prefecture are registered in the Kesen-numa Distant Water Fishery Cooperative (“*Kesen-numa enyo gyogyo kyoudo kumiai*”)³. In 2006, 23 are still actively operating (Table 2).

2. Development of landings and landing values of swordfish in Kesen-numa

The structure and organization of fisheries evolves over time in response to changes in the market, technology and the scarcity of resources. The development of landings and landing values are the compounding results of these complexities.

With depletion of other tuna resources in the North Pacific, the economic importance of swordfish fisheries in Kesen-numa is rising more and more in recent years. Since 1989, the landing of swordfish at the port of Kesen-numa have varied little from around 5,000 MT and 40,000,000 USD per year while total landings have decreased from around 131,000 MT and 310,000,000 USD in 1989 to 100,000 MT and 210,000,000 USD in 2006. In response to the significant decreases in the total landing and landing

² Excluding small tuna fishery licensed longline fishing vessels.

³ In Japan, all commercial fishing vessels need to be a registered member of a fishery cooperative to operate.

values, the share of swordfish in landing values rose from 14% in 1989 to 20% in 2006 (Table 1). The gross production of the fishing industry is around 8 - 10% of the total gross production of the city of Kesen-numa between 2000 and 2004 (City of Kesen-numa, 2009). This implies that swordfish landings alone are worth 1.6 - 2.0% of the annual gross production of the city of Kesen-numa. Considering production and employment in processors and associated industries, this fact verifies the economic significance of the swordfish fishery for the city of Kesen-numa.

3. Fishing effort

Fishing effort indicates the level of fishing activities as well as the incurring costs of operations. Fishing effort can be measured in various forms; the size or number of fishing vessels, number of time that fishing gears are applied and trip days of vessel operations. In the longline fishery, two forms of fishing effort, total number of hooks and days of operations, are often used as indicators of the magnitude of fishing effort.

The total number of hooks in the off-shore long line fishery has declined dramatically from 1994 to 2006 (Figure 1). In 1994, the total number of hooks applied by the off-shore longline fishery was 2,252,717. It diminished to 1,008,440 hooks in 2006. The number of off-shore longline fishery vessels registered at the Kesen-numa Distant Water Fishery Cooperative has declined from 45 vessels in 1994 to 23 vessels in 2006 (Table 2). This reduction in the number of vessels would have caused the massive reduction in the total number of hooks over twelve years.

The time necessary for fishing activities is not only dictated by directing fishing gear, but also by searching for fish schools or good fishing grounds. Days of operation per trip is a more complete indicator of fishing effort over time, since this includes time for all activities oriented for fishing. In table 3, the average days per trip indicates the average days between leaving and arriving at a port, and the average operation days per trip indicates the days where fishing gear is applied during a trip. The average days per trip showed a trend of steady increase from around 27 days to 34 days (approximately 25% increase) over 12 years. The average days of operations increased from around 18 days to 20 days (approximately 10% increase). Extending operations to search for or travel to fishing grounds would lead to a lower marginal increase in the average days of operations relative to the total days per trip. A future spatial analysis using logbook data may reveal more detailed changes in behaviours of

the operation of off-shore longline fishing vessels.

A graphical/snapshot analysis shows that the trip days and landing values exhibit a positive linear trend⁴ between 2004 - 2006⁵ (Fig. 2) – that is, more days per trip bring more revenue (landing value) per trip. Note that this trend does not suggest that more days in a trip brings more profit to fishers, as they cause a vessel to incur variable costs (e.g., fuel, labour) and degradation of value of already harvested fish⁶. To estimate the potential profit from additional operation, variables capturing costs per day of operation and potential harvest upon additional days must be found in future studies.

5. Concluding remarks

This short paper is intended to be a descriptive overview of the economics and operations of the swordfish longline fishery in Kesen-numa City, and in conjunction with Ishimura and Yokawa (2008), to review available descriptive data about the economics and operation of the swordfish longline fishery in Kesen-numa City. To draw a complete picture of the swordfish fishery at Kesen-numa, field research in Kesen-numa is also necessary to collect data.

References

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Ishimura, G and K. Yokawa 2008 “Preliminary economic overview of the swordfish longline fishery in Kesen-numa, Japan” ISC/08/ MARLIN&SWO-WG/13

⁴ Linear model: Landing values at trip ~ Days per trip

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)	
(Intercept)	1654.5	175.5	9.4	< 2e-16	***
Days per trip	12.5	4.3	3.0	0.00349	**

** and *** denotes 5 % and 1 % significant level

⁵ Data for the landing values per trip is currently only available for 2004, 2005 and 2006.

⁶ Analysis of the freshness premium on swordfish can be found in ISC/09/BILLWG-SS/.....“The market value of freshness: Preliminary evidence from a swordfish and blue shark pelagic logline fishery and market.”

	Swordfish	Swordfish	Total	Total	
	Landings	Landing value	Landings	Landing value	Share of swordfish in landing values
Year	MT	1000 USD	MT	1000 USD	%
1989	6,361	44,600	131,831	318,981	0.14
1990	5,643	44,633	134,535	350,188	0.13
1991	4,102	39,388	149,044	315,432	0.12
1992	5,271	43,969	131,205	307,545	0.14
1993	5,193	40,605	138,711	276,631	0.15
1994	4,949	39,768	117,874	252,906	0.16
1995	4,913	39,267	123,952	254,331	0.15
1996	4,544	40,446	93,844	250,642	0.16
1997	4,728	43,612	140,657	306,442	0.14
1998	4,847	43,238	107,046	281,582	0.15
1999	4,806	38,322	112,740	290,252	0.13
2000	5,285	42,098	131,547	298,352	0.14
2001	4,561	40,359	128,780	285,686	0.14
2002	4,568	39,956	90,825	243,547	0.16
2003	4,400	34,284	109,067	215,495	0.16
2004	4,614	36,723	89,855	204,798	0.18
2005	4,507	38,344	119,162	217,121	0.18
2006	5,150	42,118	107,127	213,580	0.20

Table 1: Swordfish and total landing and landing values, and share of swordfish in the total landing values in Kesen-numa.

Year	Number of firms	Number of 20 -119 MTG off-shore longline vessel
1994	40	45
1995	36	61
1996	34	41
1997	29	38
1998	25	33
1999	26	34
2000	25	33
2001	25	34
2002	25	34
2003	24	20
2004	23	24
2005	25	28
2006	23	23

Table 2: Number of firms and 20-119 MT capacity longline vessels registered at the Kesen-numa Distant Water Fishery Cooperative.

Year	Average days per trip	Average operation days per trip
1994	27.7	17.4
1995	29.3	18.3
1996	30.3	18.3
1997	30.4	18.2
1998	30.4	18.0
1999	31.1	18.6
2000	33.0	20.2
2001	35.3	20.7
2002	35.7	20.8
2003	34.3	20.0
2004	32.4	19.3
2005	34.0	20.0
2006	34.6	20.6

Table 3: The average days and operation days per trip for off-shore longline fishery in Kesen-numa.

Figure 1: The total number of hooks in the fishery between 1994 and 2006.

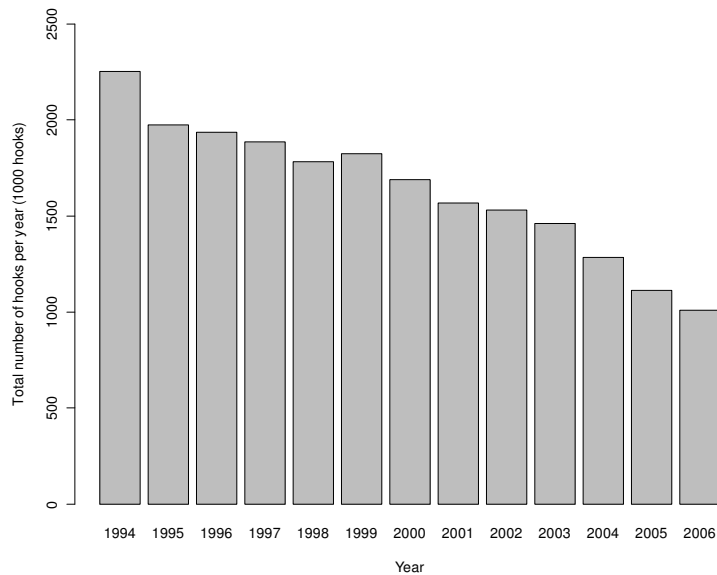


Figure 2: Scatter plot of landing values and trip days for off-shore longline vessels in Kesen-numa between 2005 and 2007.

