

STATUS AND PROSPECTS OF KOREAN FISHERIES

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1. SUMMARY

The Korean fisheries is highlighted by a rapid increase in annual total production until 1990 but its trend has nearly leveled off in the recent years. The total catch from coastal and off-shore fishery maintained an increasing trend; while production from aquaculture has gradually increased, the inland water fishery decreased starting in 1980. The annual total catch by group of species maintained a steady upward trend except for finfish catch which showed a decreasing trend in the recent years.

The number of fishing vessels increased gradually from year to year until 1990, then decreased in 1995. The yearly average tonnage per boat increased from 5.2 tons in 1970 to 12.2 tons in 1994. While the powered vessels increased year after year, the non-powered vessels decreased sharply from 54,270 in 1970 to 7,309 in 1994.

The total population engaged in the fishery industry sector has decreased continuously every year. Annual average income of fishery employee household has significantly increased from US \$3,200 in 1980 to US \$23,475 in 1995. The production of fishery products in recent years remained at a constant level. The total amount of import of fishes and fishery products sharply increased in recent years while the exports did not vary recently.

Korean fishery industry has been facing serious difficulty not only due to the decrease of coastal and off-shore fishery resources but also the withdrawal of deep-sea fishing vessels from the coastal country's jurisdiction areas following the extension of 200 nautical miles exclusive economic zone (EEZ). Accordingly, some suggestions are given in this report to overcome the present and future anticipated difficulties.

2. INTRODUCTION

Korea has a long history not only in terms of exploitation and utilization of fishery resources but also on management systems for the purpose of conservation of the marine living resources. The abundant fisheries around Korean peninsular made a significant contribution to the development of the Korean fishery industry. The annual production from both marine and inland water fisheries has generally kept an increasing trend until recently. But the Korean fishery industry is faced with some difficulties. Since the late 1980s, it has suffered from overcapitalization, excessive fishing pressure, and low financial returns compared with those of the other economic sectors.

The main reason for the waned fisheries is due to the overfishing of commercially important fishery resources such as highly migratory species and straddling stocks that migrate across the boundaries of the neighboring countries. This report describes the general trend in fishery production and the status of Korean fisheries for each 10-year period between 1970s and 1990s.

3. THE PRESENT STATUS OF THE KOREAN FISHERIES

In 1970 the total fish production was recorded at about 935,000 mt. The catch from coastal and off-shore fishery was 726,000 mt, accounting for 77.6% of the total production, 119,000 mt (12.8%) from aquaculture, 90,000 mt (9.6%) deep-sea fishery and 380 mt from inland water fishing. The breakdown for species group showed that finfishes were about 596,000 mt corresponding to 63.7% of the total production, 189,000 mt (20.2%) from mollusks and 117,000 mt (12.5%) from seaweeds (Table 1).

In 1980, total production has increased to about 158%, 2.4 million mt over the 1970 total production. The total catch from coastal and off-shore fishery was about 1.4 million mt, 57.0% of the total production. The total harvests from aquaculture, deep-sea fishery and inland water fishing amounted to about 540,000 mt (22.4%), 458,000 mt (19.0%) and 39,000 mt (1.6%), respectively. The total harvests by species group were about 1.5 million mt for finfishes, 524,000 mt for mollusks, 317,000 mt for seaweeds and 53,200 mt for crustaceans, accounting for 62.1%, 21.7%, 13.2% and 2.2% of the total harvest, respectively (Table 1).

The 1990 total production reached to about 3.27 million mt. This figure was 3.5 as much as the total catch of the 1980s. The catch from coastal and off-shore fishery was recorded at 1.54 million mt which corresponded to 47.1% of the total, about 925,000 mt (28.3%) from deep-sea fishery, 723,000 mt (23.6%) from aquaculture and 34,400 mt (1.0%) from inland water fishery. According to species group, finfishes were about 1.9 million mt, accounting for 57.7% of the total production, 784,000 mt (23.9%) mollusks, 442,000 mt (13.5%) seaweeds, and 119,000 mt (3.6%) crustaceans (Table 1).

The total production in 1995 was about 3.3 million mt, an increase of 0.7% over the 1990 total figure. The total catch from coastal and off-shore fishery was about 1.3 million mt, accounting for 39.4% of the total production, 1.0 million mt (31.1%) from deep-sea fishery, 935,000 mt (28.4%) for mollusks, 604,000 mt (18.4%) for seaweeds and 115,000 mt (3.5%) for crustaceans.

Korean fisheries is highlighted by a rapid increase in annual total production until 1990, a trend which has nearly leveled off in recent years. The total catch for each different fishery showed that coastal and off-shore fishery and deep-sea fishery maintained an increasing trend until 1990 but decreasing in 1995; while the catch from aquaculture continued to increase; and that from inland water fishery has gradually decreased since 1980. The annual total catch by group of species has kept a steady upward trend except finfishes catch which decreased in recent years.

From the above-mentioned data, the total catch from coastal and off-shore fishery was approximately 726,000 mt in 1970. The catch increased to about 1.37 million mt and 1.54 million mt in 1980 and 1990, respectively. In 1995, however, it was recorded to be only 1.43 million mt, indicating a decrease of 8.2% compared with the volume in 1990 (Table 1).

The main target species from the coastal and off-shore fishery include anchovy, common squids, Pacific mackerel, file fish, etc. (Table 2). There has been significant change in the annual catch for these targeted species. Until 1990, file fish took a top place in the annual total catch, reaching about 230,000 mt per annum, but decreased to about 1,800 mt in 1995. Since 1980, the catch of anchovy remained at a level of 169,000 mt and peaked to about 230,000 mt in 1995. The long term fluctuation in annual catch for the main target species such as common squids, Pacific mackerel, croakers, showed an increasing trend but the other species showed a downward trend.

The annual total catch from deep-sea fishery showed a significant increasing trend (Table 1). The 1970 catch was only about 90,000 mt. In 1980, the catch increased to 458,000 mt and the 1990 catch was doubled over the 1970 figure amounting to 925,000 mt. In 1995, the catch decreased to as much as 897,000 mt.

The commercially valuable fish species from the Korean deep-sea fishery are walleye pollock, squids, and tunas and tuna-like species, consisting of more than 83% of the annual total catch (Table 3). The total catch of walleye pollock was only 13,000 mt in 1970 but it increased tremendously to about 190,000 mt in 1980 and 337,000 mt in 1995. The catch of squids showed a fast upward trend. In 1970, the total catch was negligible to be only 900 mt, but this increased to about 21,000 mt in 1980. Its catch was significantly increased to 229,000 mt in 1990 and then it was decreased to 193,000 mt in 1995. The total catch of tunas and tuna-like species was about 61,000 mt in 1970, accounting to 68.2% of the total catch from deep-sea fishery. In 1980, it doubled nearly to 118,000 mt and was up 106% to about 242,500 mt in 1990. But the total catch declined to about 227,000 mt in 1995 (Table 3).

The annual total harvest from aquaculture has been increasing year after year (Table 1). In 1970, the total harvest was about 120,000 mt. This significantly increased to 540,000 mt in 1980 and 996,000 mt in 1995. Based on the aquaculture harvest by species group, marine finfishes was only 22 mt in 1970 and then increased significantly to 8,400 mt in 1995 (Table 4). Culture of marine finfishes commenced with yellow tail in the 1980s. Later on, commercially important fish species such as bastard halibut, sea bream, sea bass, rock fishes were cultured in the late 1980s using improved aquaculture techniques. The harvest for bastard halibut was about 1,000 mt in 1990 and 6,700 mt in 1995. The harvest from shell fish culture increased from about 75,000 mt in 1970 to 312,000 mt in 1995. Of this, oyster showed a rapid increasing trend from about 37,000 mt in 1970 to 191,000 mt in 1995, accounting for 50-70% of the production per annum. This was followed by sea mussels with a proportion of 20% on an average, of the total harvest. The seaweed harvest increased from about 44,000 mt in 1970 to 661,000 mt in 1995. Of the annual harvest, sea-mustard and laver culture increased rapidly from 6,600 mt in 1970 to 386,000 mt in 1995 and from 36,000 mt in 1970 to 193,000 mt in 1995, respectively (Table 4).

The total production from inland water fishing and fresh water culture maintained at a level of 34,000 mt in recent years (Table 4). In 1995, the total capture from inland water fishing was recorded to about 29,000 mt. The main species cultured were Israel carp using net cage, trouts and eels. The harvest in 1995 was approximately 10,500 mt for Israel carp using net cage, 2,800 mt for trout and 2,300 mt for eel, respectively (Table 5).

The total number of Korean fishing vessels registered was 68,355 in 1970, which have shown a gradually increasing trend from year to year until 1990 at a peak of 99,658 vessels (Table 6). In 1994, however, the number of fishing vessels decreased by 5.5% to 77,391.

The yearly average tonnage per boat increased from 5.2 gross mt in 1970 to 12.2 gross mt in 1994. The number of fishing vessels equipped with diesel engine power was 14,085 in 1970. The number of powered vessels peaked in 1990 with 79,365 increasing by 5.6 times since 1970 but in 1994 the number was reduced to 70,082 vessels. On the other hand, the number of fishing vessels with non-powered vessel declined rapidly from 54,270 in 1970 to 21,754 in 1990, a decrease of 60% compared with the 1970 figure. The composition of the vessel consisted of 20.6% powered vessels and 79.4% non-powered vessels in 1970. From the 1980s onward, the powered vessels were increased year after year while the non-powered vessels decreased (Table 6).

One Korean longliner participated in exploratory fishing for tunas in the Indian Ocean for the first time in 1957. Since then, the deep-sea fishing vessels that are catching not only pelagic fishes like tunas but also demersal fishes such as walleye pollock, have increased every year and peaked at a total of 810 vessels in 1990 but decreased to 637 in 1995 (Table 7). The main reason for this decline was the decrease of tuna longliners and complete withdrawal of the squid drift gillnetters in connection with the UN resolution adopted in 1992.

The total population engaged in the fishery industry sector has decreased continuously from year to year (Table 8). In 1970, the fishery employee population was estimated to be about 1,165,000 and its population in 1994 was down by 67.2% to 382,000, a decrease of about one-third of the 1970 figure. The total fishery household has also shown a significant decreasing trend every year. In 1994, it was estimated to be about 110,000, a decrease of 43.5% over the 1970 figure. The mean population per household was 6 persons in 1970 but this decreased to about 3.5 persons in 1994 (Table 8).

The annual average income of fishery household was about 2.6 million won (US \$3,245; 1\$=800 won) in 1980. In the 1990s, it significantly increased to 10 million won (= \$12,500) in 1990 and 18.8 million won (= \$23,400) in 1995, indicating approximately 4 or 7 times increase from the 1980 figure (Table 9). Annual net income from fishery activities was estimated at 1.75 million won (= \$2,190) in 1980. The fishery income in 1990 and 1992 increased to about 5.2 million won (= \$6,500) and 9.4 million won (= \$11,800), respectively (Table 9). Non-fishery income however comprised large portion of the annual fishery household economy. It was up by 5.6 times to 4.8 million won (= \$6,000) in 1990 and up by 11 times to 9.3 million won (= \$11,700) in 1992 over the 1980 figure (Table 9).

The total fishery products processed from fisheries production amounted to about 106,000 mt in 1970 (Table 10). In 1980, the figure increased to 367,000 mt which was 3.6 times as much as the 1970 volume. In 1990s, the total fishery products recorded at a level of 1.76 million mt, showing an increase of about 17 times and 5 times than those of 1970 and 1980, respectively.

The total fish products from catches of coastal and off-shore fishery peaked at 887,000 mt in 1995 (Table 10). The total products from deep-sea fishery catches were about 882,000 mt in 1990 and decreased to 782,000 mt in 1995, accounting for 50.3% and 46.9% of the annual total products, respectively. Complex processed products produced from the coastal and off-shore fishery catches, increased from 7,600 mt in 1970 to 371,000 mt in 1990, but in 1995 it decreased to 307,000 mt (Table 10). Simple processed products also kept an increasing trend and in 1995, the production was about 578,000 mt.

Frozen products (prototype frozen) as a major component of the simple processed products showed a gradual increasing trend amounting to 430,000 mt in 1995. The fishery products from deep-sea fishery catches mainly include frozen products (prototype frozen), accounting for 93.8% of the total products in 1995.

Total amount of export for fishes and fishery products was recorded to about US \$82.7 million in 1990 (Table 11). It increased to 760 million dollars in 1980 and reached to 1.7 billion dollars in 1990. The main components of the exports were live and fresh fish and tunas from deep-sea fishery accounting for 51.4% of the annual total export in 1995.

Total amount of import of fishery products was about 41 million dollars in 1980 (Table 12). That figure significantly increased to 1,318 million dollars. Among the imported components every year, raw materials for export and fishery products for domestic consumption accounted for over 50% of the total import.

4. PROSPECTS OF KOREAN FISHERIES

Korean fishery industry had developed outstandingly through catches from both coastal and off-shore fishery and deep-sea fishery, until the mid 1980s. Since then however, the fishery industry has been facing serious difficulty not only due to the decrease of the coastal and off-shore fishery resources but also because of the withdrawal of deep-sea fishing vessels from the coastal country's jurisdiction areas following the extension of 200 nautical miles exclusive economic zone (EEZ).

In conjunction with the rapid development of Korean industry in recent years, coastal zone, especially spawning and nursery areas with the nation's coastal waters has been destroyed from land reclamation and dredging for new harbors/ports. Water pollution and red tide have also given serious problems to the recruitment of the fishery resources as well as to aquaculture production. In fact, total production from coastal and off-shore fishery has leveled off at 1.5 million tons until the middle of 1980s and decreased to 1.4 million tons in 1995 despite wide expansion of fishing grounds to the East China Sea, modernization of fishing fleet, and use of new fishing equipment with improvement of fishing techniques.

Deep-sea fishery has been also waning in recent years due to the implementation of strict fishing regulations in the EEZ of the high seas and increased fishing fees in coastal nations. As a matter of fact, the 1995 total catch from deep-sea fishery showed significant decrease compared with the previous year's catch together with the decrease in number of fishing vessels.

In connection with the World Trade Organization (WTO) provision, on the other hand, Korean domestic fishery market was fully opened from July 1, 1997. Under current domestic circumstances, fishery competency is expected to be much more difficult than before.

In conclusion, there will be obstacles for the fisheries in Korea to be experienced in future as in the past years. Accordingly, the following measures should be seriously considered to overcome the future anticipated difficulties:

- a) **Protection of spawning and nursery grounds from land reclamation and dredging of harbors;**
- b) **Environmental impact assessments for various pollutants;**
- c) **Responsible fishing (optimum mesh size, prohibition of fishing small size fish, compliance of closed area and fishing season, etc.);**
- d) **Irregular fishing ban and fostering of living marine resources;**
- e) **Bio-engineering applications for aquaculture techniques;**
- f) **Enhancement of fishery resources through mass production of seedling and releasing them to the sea;**
- g) **Development of new seafood processing technology and quality improvement;**
- h) **Development of techniques for control of fish behavior;**
- i) **Establishment of reasonable management system; and**
- j) **Strengthening of international fishery cooperation and improvement of fishery business administration.**

Table 1. Total production by fisheries sector and by fishing ground of species

	1970		1980		1990		1995	
	Catch (ton)	%	Catch (ton)	%	Catch (ton)	%	Catch (ton)	%
Coastal and off-shore fishery	726,231	77.63	1,372,347	56.94	1,542,013	47.09	1,425,213	42.57
Deep-Sea fishery	89,621	9.58	458,209	19.01	925,331	28.26	897,225	26.80
Aquaculture	119,228	12.75	540,564	22.43	772,731	23.60	996,452	29.76
Inland water fishery	382	0.04	39,226	1.63	34,431	1.05	29,294	0.87
Total	935,462	100	2,410,346	100	3,274,506	100	3,348,184	100
Finfishes	595,977	63.71	1,497,879	62.14	1,887,867	57.65	1,694,827	50.62
Crustaceans	16,363	1.75	53,209	2.21	118,822	3.63	120,005	3.58
Mollusks	188,830	20.19	523,777	21.73	783,652	23.93	826,853	24.70
Seaweeds	116,655	12.47	317,189	13.16	442,208	13.50	671,471	20.05
Other aquatic species	17,637	1.89	18,292	0.76	41,957	1.28	35,028	1.05

Table 2. Catches of major fish species from coastal and off-shore fishery

	Unit: tons							
	1970		1980		1990		1995	
	Catch	Place	Catch	Place	Catch	Place	Catch	Place
Anchovy	54,047	4	169,657	3	168,101	2	230,675	1
Squids	72,219	1	108,756	5	75,293	6	200,897	2
Pacific mackerel	38,256	5	62,690	6	97,225	5	200,481	3
Hair tail	69,082	2	119,980	4	103,970	4	94,596	4
Shrimp	10,697	8	23,548	9	58,343	7	36,008	6
Covenians	55,172	3	48,843	7	42,981	8	45,198	5
Sardian	101	11	38,282	8	132,924	3	13,539	8
File fish	-		229,230	1	230,252	1	1,755	12
Jack mackerel	883	10	565	12	17,376	10	12,269	9
Blue crab	2,700	9	19,734	10	23,415	9	17,651	7
Walleye pollock	13,418	7	217,886	2	9,798	11	6,903	10
Saury	25,275	8	13,515	11	5,341	12	6,544	11

Table 3. Catches of major fish species from deep-sea fishery

Unit: tons

	1970		1980		1990		1995	
	Catch	%	Catch	%	Catch	%	Catch	%
Walleye pollock	12,708	14.18	189,774	41.42	311,703	33.69	336,810	37.54
Squids	909	1.01	21,344	4.66	228,993	24.75	193,107	21.52
Shrimps		0.00	3,422	0.75	1,839	0.20	722	0.08
Tunas	61,120	68.20	117,927	25.74	242,514	26.21	227,173	25.32
Others	14,884	16.61	125,742	27.44	140,282	15.16	139,415	15.54
Total	89,621	100	458,209	100	925,331	100	897,227	100

Table 4. Harvest of marine culture by species

Unit: tons

	1970	1980	1990	1995
Finfish	22	38	2,655	8,360
Yellow tail		7	462	159
Bastard halibut			1,037	6,733
Sea bream			228	25
Sea bass			391	193
Rock fishes			386	1,159
Others	22	31	151	91
Shell fish	74,868	282,559	325,592	312,252
Oyster	36,981	173,051	219,124	191,156
Sea mussel	6,888	61,301	9,759	75,353
Cockle, Short necked calm,	25,042	37,921	73,058	28,353
Cicina calm				
Ark shell		2,301	17,758	9,357
Others	5,957	7,985	5,893	8,033
Seaweeds	44,343	257,965	444,483	661,417
Sea mustard	6,625	196,147	269,333	386,819
Laver	35,782	56,274	97,637	192,960
Lamanaria	1,148	940	8,084	27,295
Others	756	4,519	36,815	42,025
Other aquatic species	32	85	32,614	12,318
Total	119,265	540,647	805,344	994,347

Table 5. Harvest of inland water culture by species

	Unit: tons			
	1970	1980	1990	1995
Common carps	3.0	287	1,300	714
Net cage (Israel carp)			9,487	10,481
Eel	9.4	246	1,146	2,345
Trouts	3.4	9	1,529	2,786
Snake-head fish		41	446	558
Tilapia			650	693
Others	1.4	441	1,288	2,788
Total	17.2	1,024	15,846	20,365

Table 6. Fishing vessels and fishing power

		1970	1980	1990	1995
Number of vessels		68,355	77,574	99,658	77,391
Gross tonnage		358,365	770,688	976,731	940,322
Average tonnage per boat		5.2	9.9	10.2	12.2
Powered vessels	No.	14,085	51,113	79,365	70,082
	G.T.	268,182	740,266	945,977	930,376
Non-powered vessels	No.	54,270	26,461	21,754	7,309
	G.T.	90,183	30,422	21,754	10,245
Percentage of	No.	20.6	65.9	79.6	99.3
powered vessels	G.T.	74.8	96.1	96.9	98.9

Table 7. Number of fishing vessels by fishing types in Korean deep-sea fisheries

	1970	1980	1990	1995
Tuna fishing boats	246	441	315	256
Squid fishing boats		27	230	124
Trawlers	32	241	247	225
Saury fishing boats			7	12
Others		41	11	20
Total	278	750	810	637

Table 8. Fisheries population and households

Unit: thousand

	1970	1980	1990	1995
Fishery employee population	1,165	843	523	382
Ratio to gross national population (%)	3.6	2.2	1.2	0.9
Fishery households	195	157	128	110
Persons per household	6	5.4	4.1	3.5

Table 9. Income of fishery household

Unit: 1,000 won () : US\$

	1970	1980	1990	1995
Income of fishery employee household		2,596	10,023	18,780
		3,245	12,529	23,475
Fishery income		1,752	5,216	9,437
		2,190	6,520	11,796
Non-fishery income		844	4,807	9,343
		1,055	6,009	11,678

Table 10. Production of processed fishery products

	Unit: thousand tons			
	1970	1980	1990	1995
Total	105.6	366.9	1,755	1,669
Coastal and off-shore waters products	105.6	366.9	873	886.8
Complex processed products	7.6	41.3	371	308.6
Frozen products (processed frozen)			94	74.3
Products of fish-paste products	0.4	13.1	58	107.7
Canned foods	5.3	11.1	97	63.1
Fish meal and oils	0.5	10.2	31	48.9
Seasoned products	0.9	6.2	90	14.2
Agar-agar	0.5	0.7	1	0.4
Simple processed products	98.0	325.6	502	578.2
Frozen products (Prototype frozen)	62.3	186.6	349	430.3
Processed seaweeds	11.3	43.6	32	94.4
Dried products	17.6	54.4	21	36.7
Salted and fermented products	6.2	37.4	88	16.8
Others	0.6	3.6	12	
Deep-Sea fishery products			882	781.7
Frozen products			878	771.3
Prototype frozen			770	733.3
Processed frozen			108	38
Fish meal and oils			4	10.4

Table 11. Exports of fishes and fishery products

	Unit: thousand US \$			
	1970	1980	1990	1995
Live and fresh fish	11,353	128,338	328,349	394,902
Frozen products	5,994	102,656	205,698	234,374
Seaweeds and pickled products	15,910	85,506	156,050	157,252
Canned foods	375	28,230	85,064	127,153
Others	11,444	62,928	266,668	316,226
Deep-sea catches	37,663	351,866	471,265	488,840
Total	82,739	759,524	1,513,094	1,718,747

Table 12. Imports of fishes and fishery products

	Unit: thousand US \$			
	1970	1980	1990	1995
Raw material for export		38,400	169,000	416,000
Products for the fishery			63,000	628,000
Cooperative projects				
Food materials for tourist industry			4,000	
Joint fishery products			28,000	
Fishery products for domestic consumption		2,200	104,000	274,000
Total		40,600	368,000	1,318,000