Recent Status of Taiwanese Tuna Fisheries in the North Pacific Region for 2003[1]

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ABSTRACT

Distant water longline (DWLL) and offshore longline (OSLL) were the two major tuna fisheries in the North Pacific Ocean. Total number of DWLL vessels in the entire Ocean was 142 in 2003 but reduced to 134 in 2004. Albacore is the major catch of DWLL in the North region. The catch has been increased significantly since 1995, but the amount is still less than 10% of the albacore catch by all the fleets in the region. Catches of 2003 is estimated as 6,454 mt, a continuous decrease since 2000. The proportion of northern catch to the entire ocean has been declined from 44% in 2000 to 31% in 2003. The size of albacore caught in DWLL for 2000-2002 ranged from 50 to 120 cm with two joint modes: roughly 80-90 cm and 90-105 cm. Albacore size from the OSLL was one mode and within the range of the second mode of DWLL. North Pacific swordfish and bluefin tuna were mainly caught by OSLL. The 2003 catch estimates were 3,196 mt and 1,863 mt, with preliminary 2004 estimations of 3,200 mt and 1,700 mt, respectively.

To fulfill the responsibility of fishing nation and to respond to the anticipation of international fishery societies, a program to improve the quality of fishery statistics has been launched this year. This program includes proposals to review the historical data such as catch and size data. It also includes the initiation or expansion of some programs to collect more fishery-independent data.

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1. FISHERIES AND CATCHES

1.1. General overview

There are two major tuna fisheries currently operating in the North Pacific Ocean: the distant water longline (DWLL) and the offshore longline (OSLL) fisheries. The distant water purse seine fishery has fished partly in the North region, but mostly in the Western Central Pacific Ocean. Some other domestic fisheries such as harpoon fishery have also caught tuna and tuna-like species in the region, but only incidentally. Therefore the following introduction will focus on the longline fisheries.

Catches of the major species concerned by ISC and the data collection system are provided in the following sections. It may need to be highlighted that a program to improve the quality of fishery statistics has been launched this year to fulfill the responsibility of fishing nation and to respond to the anticipation of international fishery societies. This program includes proposals to review the historical data such as catch and size data. It also includes the initiation or expansion of some programs to collect more fishery-independent data. It is explained in Section 2.2. Preliminary revision of albacore catches of 2000-2003 was proposed and described in the same section.

1.2. Distant water longline fishery

The distant water vessels refer to those vessels larger than 100 gross registered tons (GRT). These vessels mostly operated in the high seas area or in the EEZs of coastal countries under license. Since their catch is in frozen form, the fishery is also referred as frozen tuna longline fishery. Total number of vessels operating in the entire Pacific region in 2003 was estimated to be about 142. The number of vessels has been reduced to 134 in 2004.

The catch of albacore in the North region was, in general, very low for Taiwanese fleet before 1995. But following the substantial increasing trend by longline and pole-and-line fleets of other countries, the Taiwanese catch has been increased thereafter. The catch however is still less than 10% of the overall catches by all the fleets in the region. Revised catches of 2003 is estimated as 6,454 mt, a continuous decrease since 2000. The proportion of northern catch to the entire ocean has been declined from 44% in 2000 to 31% in 2003. Due to the fishing

season of 2004 has not completed, the estimation of 2004 catch is still being processed.

The catch of bluefin tuna in the North Pacific was very rare and was less than 1 mt for recent years. Before 2000, the catch of swordfish in the North Pacific region was low and was less than 100 mt. Thereafter, the catch increased substantially to more than 1,000 mt.

Effort distribution of Taiwanese DWLL vessels operated in the North Pacific region during 1999-2002 is shown in Figure 1. Most of the efforts were located in the central and mid- to high latitudes (20-45^{o}N) of the region. These vessels fished for northern albacore only seasonally from about September to next March, and moved to the South Pacific fishing for southern albacore in other season.

1.3. Offshore longline fishery

The offshore longline (OSLL) vessels generally refer to those vessels smaller than 100 GRT (mostly 50-70 GRT). These vessels use flake ice or more recently, refrigerated seawater, to chill the fish caught; and, since their catch is mostly in fresh form, the fishery is sometimes referred as fresh tuna longline fishery.

The OSLL vessels generally operated in the nearby waters of Taiwan. However, in recent decades, some of them fished in distant waters or the EEZs of coastal countries under license. In this regard, the fleet is no more a pure ‘offshore’ fishery and it is difficult to distinguish the offshore catch from the distant water catch. For convenience and for the avoidance of double counting of catch, the estimation of OSLL catch is categorized as catches unloaded in Taiwan domestic ports and catches unloaded in foreign ports. Table 1 shows catch estimates of the main species concerned that unloaded in domestic fishing ports, which could be considered as from the North Pacific region taking account of geographical location of Taiwan. Catches of the OSLL based and unloaded in foreign ports will be estimated in cooperation with foreign agencies or through port sampling, but this catch is considered to be mostly from the South region.

From Table 1, there were no obvious trends for the catches of albacore and swordfish caught by OSLL in the North Pacific. The catch of albacore is generally low and fluctuated between 100 and 900 mt in the recent ten years. A preliminary estimation of 2004 catch is about 900 mt. The catch of swordfish has been lower than 2000 mt before 1997 and increased to over 2,000 mt thereafter. The 2003 catch is estimated as 3,196 mt and a preliminary estimate for 2004 is 3,200 mt.

The catch of bluefin tuna has showed an increasing trend during recent ten years to the peak record of 3,000 mt in 1999 and reduced to a level of 1,500 to 2,000 mt after year 2000. The 2003 catch estimate is 1,863 mt and the preliminary 2004 estimate is 1,700 mt.

With limited logbooks recovered, the fishing ground of OSLL vessels based at

domestic ports is shown in Figure 2. The operation was mostly located in area of 110-160 ^{o}E/10-35 ^{o}N, especially waters south and east of Taiwan and northeast of the Philippine Islands. However, this figure may not be well represented due to low recovery of logbook in the fishery.

1.4. Size samples from the longline fisheries

The size measurements on major tuna and tuna-like species caught by DWLL and OSLL fisheries in the North Pacific region is shown in Figure 3. Albacore caught in DWLL for 2000-2002 ranged from 50 to 120 cm with two joint modes: roughly 80-90 cm and 90-105 cm. Comparatively, albacore size from the OSLL was one mode and within the range of the second mode of DWLL.

The Secretariat of the Pacific Community (SPC) has conducted port sampling program for a long period, measuring size of fish at the major fishing ports of Pacific coastal countries. Albacore length measurements for Taiwanese longliners were obtained from the Secretariat with appreciations. According to the seasonality of northern albacore fishery, the length frequency for northern stock was extracted and also plotted in Figure 3 (middle panel of the left column). The size range is pretty similar to the OSLL's and consists in the second mode of the DWLL.

The swordfish caught by DWLL consists clear two modes. The size from OSLL consists only one mode, but the mode covered the range of the two modes from the DWLL with the major part in the second mode.

For bluefin tuna, size measurements from domestic fish markets for OSLL shows one mode in the range of 200-240 cm.

2. FISHERY MONITORING AND DATA COLLECTION

2.1. Data collecting system

Distant water longline fishery

Two types of fishery statistical data are routinely collected from DWLL fishery: the commercial data (for estimation of total catch), and the logbook data (for stock assessment purposes). Several sources of commercial information were available from traders, Taiwan Tuna Association, Japanese market, and so on. After cross-checking and compilation, the commercial information was used to estimate total catches of the Category I data.

The logbook data include each set of catch in number and weight by species, effort deployed, fishing location, and so on, as well as the size measurement of the first 30 fish caught each day. Categories II and III data were all compiled from this data set.

Offshore longline fishery

As mentioned in previous section, two categories of OSLL are defined: OSLL that based in Taiwan and unloading their catches at domestic fishing ports (domestic-based OSLL), and that based and unloading catches at foreign ports (foreign-based OSLL). For domestic-based OSLL, the commercial landing records from local fishing markets provide the best information for estimating the ISC Category I data of total catches. However, there was not much information to estimate total catches for foreign-based OSLL. Preliminary estimations were basically made from fishing vessels activities and importing statistics to the Japanese markets.

Logbooks have been collected by specific project from the fishery since 1997. Due to highly mobile activities of the fleet, the collection is relatively difficult and the coverage is unsatisfying for the compilation of Category II data at this stage.

Port sampling on both the trip information (location, catches and effort) and size of major tuna species in Tong-Kang, the largest domestic tuna-fishing port, has been independently collected. These data will be compiled and made available for the scientific uses in the near future.

2.2. Statistics improvement program

2.2.1. Total catch estimation (Category I data)

Distant water longline fishery

Estimation of total catch of DWLL was made from commercial information, rather than from logbooks. Several sources of commercial information are available (including certified weight reports from Japan) and in general, information relating to sashimi species is more complete. Comparatively, because of the role and structure of the fishery traders in the Pacific, estimates of Pacific albacore may need to be closely reviewed for recent years.

Therefore, the fishery authority is making efforts with pressure putting on industry this year to recover detailed trading information from different sources for data comparison and to review the total catch estimation of albacore which will be explained in Section 2.3. A process to separate northern catch from southern catch is also developed according to its fishing practice.

Offshore longline fishery

To avoid double counting and the confusion of definitions of distant-water/offshore under this category, the total catches for the tuna and tuna-like species are planned to be reviewed and re-compiled. Historical landing data at domestic fish markets have been recovered. These data are considered as the minimum estimates of the catches landed in Taiwan. These estimates will be

re-compiled and provided to the Committee after finalization.

As for the catches landed in foreign ports, the authority is seeking cooperation opportunities with coastal countries/international agencies to obtain best estimates. A pilot port sampling program will also be initiated this year to collect more landing information from Taiwanese longliners.

2.2.2. Catch/effort data (Category II data)

A set of original logbook data of Taiwanese DWLL for 1964-1996 collected by NMFS Honolulu Laboratory has been obtained from the Laboratory with appreciations. The data was intensively reviewed and only records with recognizable vessel information remained. After cross-checked with the Taiwanese dataset vessel by vessel, the two data sets have been compiled as one and have been utilized for stock assessment by our scientists.

The combined logbook data will be reviewed again for finalization. When the revision of Category I data is completed, the data will be re-compiled and raised to total catches. Taking the recommendation from NPALB19 in 2004, the raising will be done separately for the North and the South regions.

For the OSLL, a scheme to verify the logbooks collected from domestic longliners will be developed. Logbooks from foreign-based OSLL have been collected by SPC in the past. Cooperation will be seeking to complete the database for future scientific analysis.

2.2.3. Size data (Category III data)

The importance of size data to the accurate stock assessment is recognized by the fishery authority. Besides the routine reporting of size data by DWLL, the port sampling program in foreign ports will be launched this year to collect size measurements from the vessels fishing in the North region. Besides of port sampling, size data will also be collected through observer program. For the first time, there was one short observing trip to the North region last year. This year at least 2-3 trips will be dispatched to the North region to collect size data. The historical length data of northern albacore will be reviewed and cross-checked when these data are available.

As abovementioned, SPC has conducted size measuring on albacore including the northern stock at Pacific fishing ports for some years. These data will be very helpful to the scientific researches, and therefore a routine data exchange with SPC will be approached.

2.2.4. Port sampling

Port sampling at domestic fish markets has started in 1997, collecting size data of the major tuna species (mainly bigeye and yellowfin tunas). However, because a significant amount of Taiwanese longliners unloading their catches at foreign ports and the data reported from industry are no longer satisfied, there becomes a need to launch a port sampling program at foreign ports, although the cost is high. Owing to no experience in sampling at foreign fishing ports, this program will started from smaller scale and can only be treated as a pilot one. To make the program efficient, it is welcomed for international joint efforts for better managing the fish resources.

2.2.5. Observer program

The experimental observer program was launched in 2001. There were 2 observers in the beginning, and increased to 6 each year in 2002-03 and to 9 in 2004. To improve the collection of reliable data, after four years of running, this year a task-forces has been formulated to formally take charge of the program. In addition, the number of observers will be increased to over 20 for the three Oceans. At least 2-3 trips will be designed for the North Pacific region, to collect fishery data and size measurements of albacore. Otoliths and gonad samples might also be collected.

2.2.6. VMS monitoring

Vessel monitoring system (VMS) has been installed voluntarily on some longliners during recent years. For better management of tuna fishery resources, all the large scale vessels are required to install VMS since this year. Besides of better monitoring the vessel activities, the data could be used to verify the logbook data and to improve the data quality.

2.3. Proposal for revision of DWLL albacore catch for 2000-2003

As mentioned in Section 2.2.1, efforts have been made to recover more information to adjust the estimation of tuna catches, especially the albacore catch. The first set of data recovered is for 2000-2003. The data has been cross-checked with the already-obtained commercial information and logbooks, and proved applicable for the adjustment. Albacore catches for those years have thus been revised preliminarily. A meeting will be held with scientists to review the revision and the feasibility for recovering longer series of data.

Due to low coverage of logbook information for the northern albacore fishery, the separation of northern catch from southern catch was made based on vessel information obtained from industry in the past. After recent discussions with fishery managers, traders and skippers who have operating experiences in the north region,

the landing records for northern albacore have been identified accordingly. The landing dates of these records matched the seasonality of northern albacore fishery from logbook information (Figure 4), and the vessels were large and new with the capability fishing in bad conditions in the North region. This adjustment has increased the percentage of northern albacore to be higher than previous estimations.

3. RESEARCHES

An integrated research project for the period of 2001-2004 on the North Pacific albacore has just finished, to investigate the age and growth, and reproductive biology for the stock from first dorsal spines and gonads, and to conduct preliminary stock assessment using VPA-2BOX algorithm. A new set of growth parameters have been estimated from the research. Information will be provided in the future when the final report is completed. Otoliths of the species are planned to be collected through observer program this year for estimating growth parameters in the future.

Studies on biological parameters on the North Pacific bluefin tuna had been conducted and published in the past. The recent researches focus on the estimation of fishery parameters and assessment of the stock status using Bayesian statistical approach and VPA.

For the North Pacific swordfish, a sex-specific age-structured model has been developed and fitted to the catch, catch-rate and length data for the Japanese high-seas and Hawaii-based longline fisheries. The results showed that the stock appeared to be relatively stable at the current level of exploitation. Part of the results has been published. A study on the sex-specific yield per recruit and spawning stock biomass per-recruit analysis to evaluate the population status of swordfish in the waters around Taiwan has been conducted and published. The results suggested that the species in the waters around Taiwan are not over-exploited.

Table 1. Catch estimates of North Pacific albacore, bluefin tuna and swordfish by Taiwanese fisheries during 1993-2003. DWLL stands for catches by the distant-water longline fishery, OSLL for the offshore longline fishery that unloaded in Taiwanese domestic ports, and Others for other fisheries such as harpoon fishery.

Unit: mt

	Albacore			Bluefin tuna			Swordfish	
Year	DWLL	OSLL	Others	DWLL	OSLL	Others	OSLL	Others
1993	5	489	-	1	471	4	1,174	310
1994	83	503	-	-	559	-	1,155	219
1995	2,025	479	-	-	335	2	1,135	225
1996	3,210	113	-	-	956	-	1,130	23
1997	3,862	337	-	-	1,814	-	2,190	6
1998	4,604	193	-	-	1,910	-	1,900	68
1999	4,561	207	-	-	3,089	-	2,234	37
2000	7,898*	802	-	-	2,780	2	2,470	60
2001	7,852*	747	1	-	1,839	104	2,727	40
2002	7,055*	910	-	-	1,523	4	2,511	24
2003	6,454*	712	-	-	1,863	21	3,196	11

* Albacore catch of 2000-03 have been preliminarily revised and will be finalized after a review meeting and recovery of longer series of data.

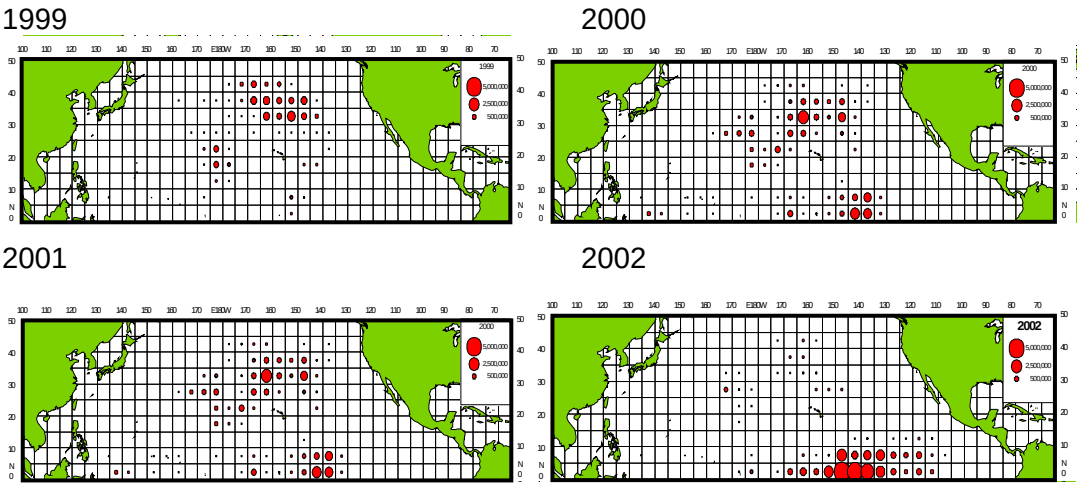

Figure 1. The effort distribution of the distant water longline fishery operated in the North Pacific region during 1999-2002. (Note: Map of 2002 is still preliminary and will be revised shortly.)

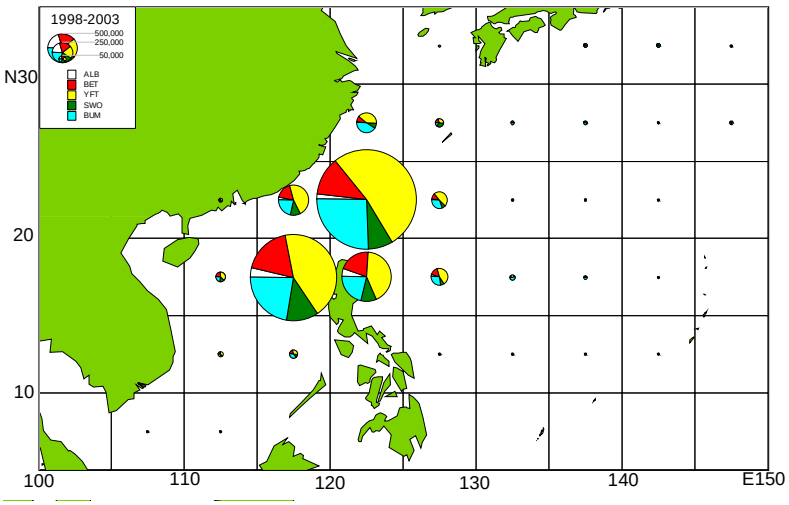

Figure 2. Distribution of catch composition of Taiwanese domestic-based offshore longline fishery in the waters around Taiwan for 1998-2003.

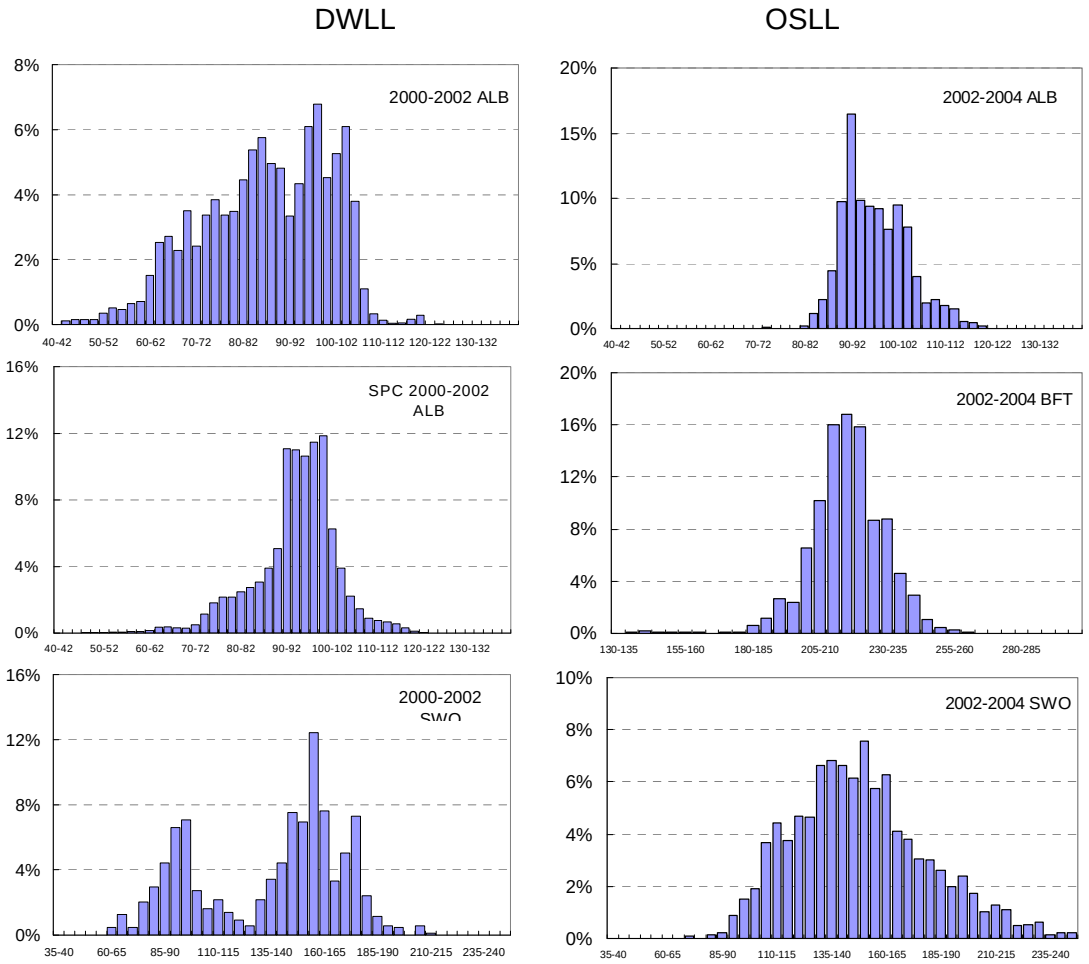

Figure 3. Length frequencies of albacore, bluefin tuna and swordfish by the distant water longline (DWLL) and offshore longline (OSLL) fisheries in the North Pacific Ocean during different periods of time (depending on the data available). The length scales are different for different species.

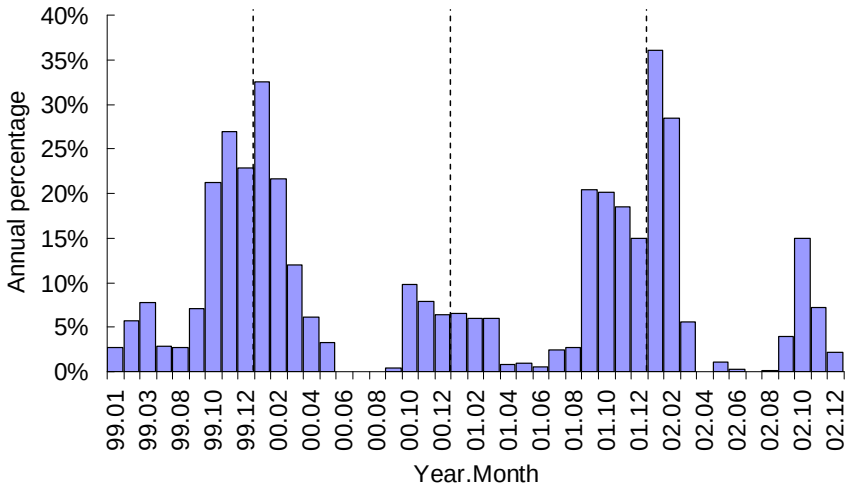

Figure 4. Monthly catch proportion of North Pacific albacore from logbook data of 1999-2002, to show the seasonality of the catch.