

SOUTH PACIFIC COMMISSION

NINETEENTH REGIONAL TECHNICAL MEETING ON FISHERIES

(Noumea, New Caledonia, 3 - 7 August 1987)

Update of SPC's DWFN Catch Coverage in the SPC Region

(Paper Prepared by the Secretariat)

General Reporting

1. The Tuna and Billfish Assessment Programme has as its main priority the collection and maintenance of catch and effort statistics on the fishery for commercially important tunas and billfish in the central and western tropical Pacific. This fishery's fleet involves vessels from many nations, employs three principal fishing methods, and is changing over time. This diversity and the evolution of reporting arrangements thus gives catch reports a patchwork-like appearance (Table 1).
2. Increases to the South Pacific Commission's data base show that in the past year, more data have become incorporated by logsheet reports than ever before. A large part of this contribution comes from catch reports received from Palau on fishing in their waters from 1964 through to 1982. Table 2 shows the increase to the catch and effort data base by individual country increases relative to previous holdings from that country. Also shown are the percentages of the total increase of the data base size over the past two years.
3. The growth of the regional data base improves its depth and strength as a resource assessment tool. Statistics on catch coverage are needed to understand the limits of the data. Gaps in the information can create serious biases when analyzing data. We need to know where data are lacking in order to make responsible assessments on the condition of the fish stocks. Statistics on catch coverage are also useful to show where more work is needed to secure information. This paper is thus presented as an update of the review of catch coverage presented in SPC/Fisheries 18/WP.5.

TABLE 1. Total catch in metric tonnes by flag of fleet and gear type as reported to the SPC. All totals expressed to the nearest 100 tonnes. Longline catches are reported in pieces and converted to weight by applying an average weight estimate. The * in the longline table indicates that average weights are not available. Early Taiwanese data include catches from south of 20° S.

Flag	1980	1981	1982	Year 1983	1984	1985	1986
Purse Seine							
Japan	17400	17500	70500	84300	107500	87900	115800
Taiwan				2900	5200	11300	10200
Korea	<100	400	1100	3600	5300	4500	2600
United States					14600	11700	6900
United States (ATA)					166000	95800	
Philippines			1500		1600	4200	1600
Panama				500	6300	800	
Honduras				700	100		
Cayman Islands				600	2400	6100	3200
New Zealand				600	600	700	
Mexico					3200		
Vanuatu							1800
Indonesia							<100
U.S.S.R.							
Others	900	2800	2800	5200	5200	2200	
Total	18400	30700	76000	98500	317800	225300	142300
Pole-and-line							
Japan	45200	37300	17000	43500	30400	19400	53000
Fiji	800	1500	4600	3200	3500	2400	2100
New Caledonia		200	1000	500			
Kiribati							200
Total	46031	39044	22611	47201	33914	21805	55413
Longline							
Japan	—	37500	35400	31500	36300	39200	19800
Taiwan	27200	20200	14900	700	3400	2900	101
Korea	300	200	600	900	600	3200	1300
Tonga			100	*	100	100	<100
Honduras						<100	
New Caledonia				*	200	500	
Others		<100	400	500	400	200	
Total	256700	58000	51400	33600	41000	46300	21300

TABLE 2. Change of SPC data holdings by country supplying daily records in terms of percent increase relative to the countries' previous contributions and relative to the total increase of the data base. The increases were tabulated for 1985-86 and 1986-87.

Data Source	1985-1986		1986-1987	
	Increase of Previous Contributions (percent)	Percent of Total Data Base Increase	Increase of Previous Contributions (percent)	Percent of Total Data Base Increase
American Samoa	0.0	0.0	0.0	0.0
New Caledonia	-	3.4	17.2	0.5
Cook Islands	0.0	0.0	100.0	0.7
Fiji	48.2	12.4	5.4	1.0
Federated States of Micronesia	16.5	37.2	12.8	21.8
Guam	0.0	0.0	0.0	0.0
Kiribati	15.9	10.9	9.3	4.6
Northern Mariana Islands	0.0	0.0	0.0	0.0
Marshall Islands	10.4	7.7	6.9	3.6
Nauru	0.0	0.0	0.0	0.0
Niue	0.0	0.0	0.0	0.0
Palau	6.6	1.2	76.6	38.6
Palmyra	0.0	0.0	0.0	0.0
Papua New Guinea	14.0	22.8	8.3	9.7
Pitcairn	0.0	0.0	0.0	0.0
French Polynesia	0.0	0.0	0.0	0.0
Solomon Islands	6.6	2.7	28.9	10.8
Tokelau	0.0	0.0	0.0	0.0
Tonga	0.0	0.0	25.9	0.2
Tuvalu	15.9	0.5	8.8	0.2
Vanuatu	28.8	4.6	0.0	0.0
Wallis and Futuna	0.0	0.0	0.0	0.0
Western Samoa	0.0	0.0	0.0	0.0
New Zealand	0.0	0.0	0.0	0.0
United States of America	0.0	0.0	39.1	8.4
Percent increase to SPC data base		17.6%		23.1%

Longline Coverage

Comparison among DWFN longline fleets

4. There are 1,287 registered longline vessels operating in the region, representing 164,705 tonnes of fish carrying capacity. Table 1 gives the catches by nationality that have been reported and are incorporated into the South Pacific Commission's data base. The distribution of numbers of longline vessels by gross registered tonnage and the three principal longline fishing nations is given in Figure 1, based on the Forum Fisheries Agency regional register of vessels. Gross registered tonnages are used to give the range and general capabilities of the fleet.

5. The Tuna Programme compiles trip reports for all catch forms received. We extract common departure and return dates for a given vessel in order to recreate individual trips. The regional vessel register maintained by the Forum Fisheries Agency contains most vessels that operate in the South Pacific Commission region. Tabulating the number of longline vessels on the Forum Fisheries Agency register by country, and comparing these with the number of trips that have been reported to the South Pacific Commission from logsheets, indicates serious under-reporting by the Taiwanese and Korean vessels (Table 3). Vessels generally have trip lengths proportional to their size, and the length of a trip determines how frequently vessels embark on new trips. Proportions of trips and proportions of vessels can thus be different if the size composition of the fleet is different between countries. It is unlikely that differences in the makeup of the fleets can explain the under-reporting that is apparent from the Korean and Taiwanese vessels. The Korean and Taiwanese vessels spend much time fishing in areas where the reporting of catch is not mandatory by access agreements, however, some records of their catch are being collected at unloading sites. The SPC has made regular requests to receive this information but only small amounts of these data have been submitted.

Trip length vs. days reported

6. Coverage of longline data within the SPC data base was checked internally by comparing the number of days that were reported and the total number of days in a given trip. As shown above, less than 0.5% of the trips reported to the SPC are from Korean vessels and 1.7% come from Taiwanese boats. This fact points out the serious lack of coverage by these fleets and further prohibits comprehensive checks on catch coverage using internal methods. Analyses of this type will thus consider only the Japanese fleet of longline vessels.

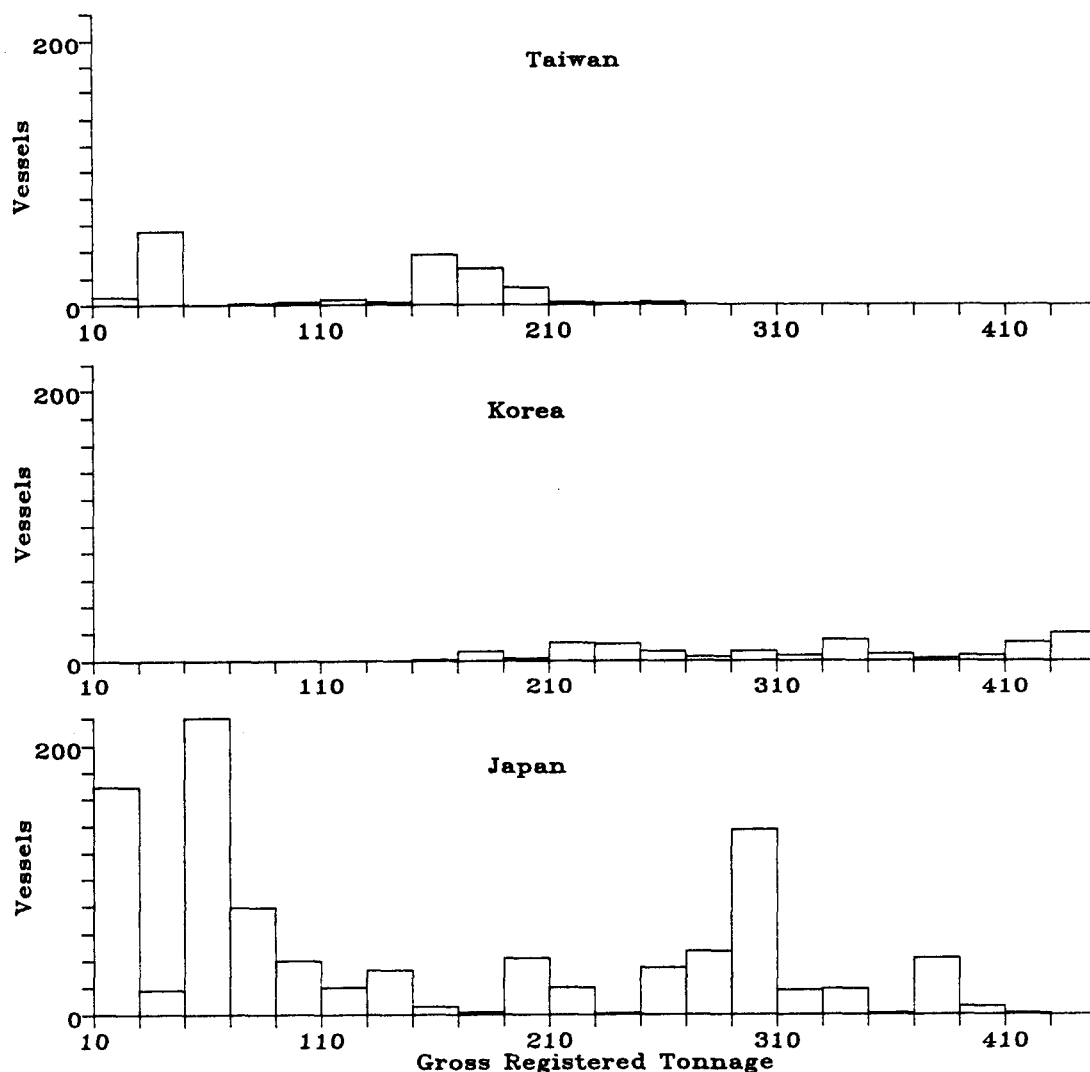


FIGURE 1. Numbers of longline vessels by gross registered tonnage and the three principal longline fishing nations.

TABLE 3. Longline fleet composition based on the number of vessels registered contrasted with the percentage of all trip information submitted to the South Pacific Commission.

DWFN	Percentage of Registered Fleet	Percentage of All Trips Reported
Japanese	78.2%	97.6%
Taiwanese	12.4%	1.7%
Korean	9.4%	<0.5%

7. The data on Japanese vessels were divided into size groups (tonnage) and years in order to compare the amount of reported days in a trip. Trips were adjusted to allow for 10, 15, and 20 days travel time to and from the fishing grounds. Plots of coverage by vessel size categories are shown in Figure 2. There is clearly an improving trend of coverage for all vessel size groups over time. The group that makes up the largest percentage of the data base has gross registered tonnages ranging from 50 - 70 tonnes. The larger vessels, >150 tonnes, have the lowest coverage proportion and have been improving only slightly over time. This is most likely attributable to the long-range nature of these vessels which primarily purchase licences so as to be able to "top up" in various areas on their return to their home port. They may only fish a very small portion of their trip within the region's waters.

8. To further illustrate the coverage of the Japanese longline fleet by vessel size category, the frequency of actual numbers of vessels falling within each category as it appears on the Forum Fisheries Agency regional register was contrasted with corresponding total trip days within our data base (Figure 3). There is good correspondence between these for most vessel size groups except for group 8 (>150 tonnes).

Geographical coverage of the longline vessels

9. A clear idea of the geographical coverage is needed when examining catch and effort data for stock assessment and monitoring purposes. Average catch rates for a given time, without consideration of the area over which it was calculated, creates problems with interpretations, particularly if there is an unidentified trend or change in the supply of data. The South Pacific Commission has entered published data of Japanese longline activities for the years 1962-80 that range over a broad area of the Pacific. After 1980, the data are no longer available and the primary source of information on the pelagic fisheries available to the region is from daily logsheets. Figure 4 contrasts the current geographical coverage of our data base generated from logsheets with published data for the same year.

Pole-and-line Coverage

10. The Japanese currently register 122 long distance pole-and-line vessels in the region representing 32,405 tonnes of carrying capacity. Table 1 gives the catches by nationality that have been reported and incorporated into the South Pacific Commission's data base. Since the development of more effective purse seine fishing in the late 1970s and early 1980s, the number of pole-and-line vessels has decreased. Prior to the establishment of the Tuna and Billfish Assessment Programme and coastal states declaration of Extended Economic Zones, limited data were published by the Japanese Government. Since 1980, only logsheet data are available as required by licensing agreements. These reports are processed and summarized by the Tuna Programme and are added to the catch and effort data base.

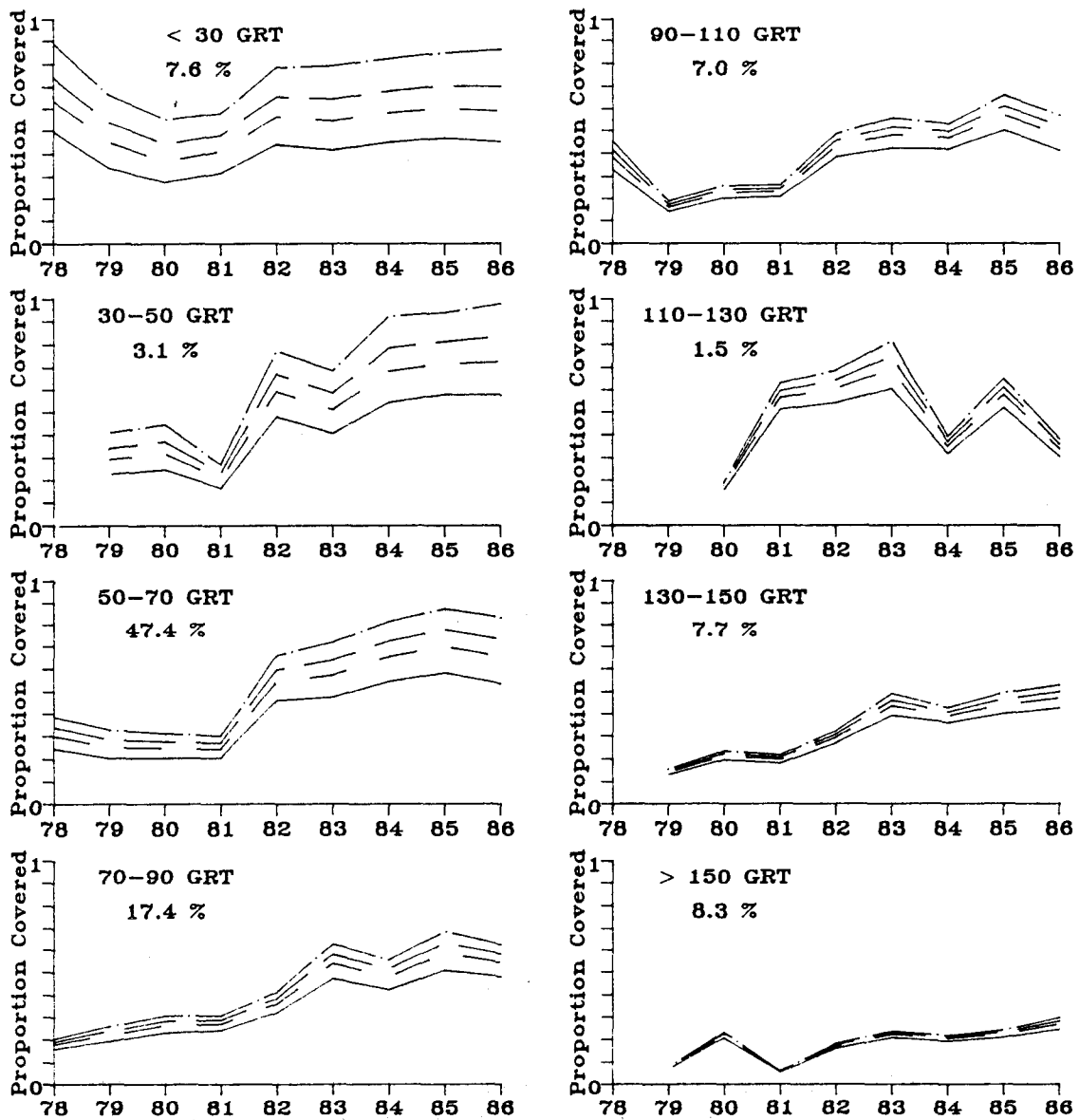


FIGURE 2. Plot of Japanese longline coverage by vessel size groups based on numbers of days reported over the entire trip length. Lines from bottom are for allowing 0, 10, 15 and 20 days in each trip for transit times to and from the fishing grounds. The figures given as percentages indicate the contribution that vessel size group makes to the South Pacific Commission data base.

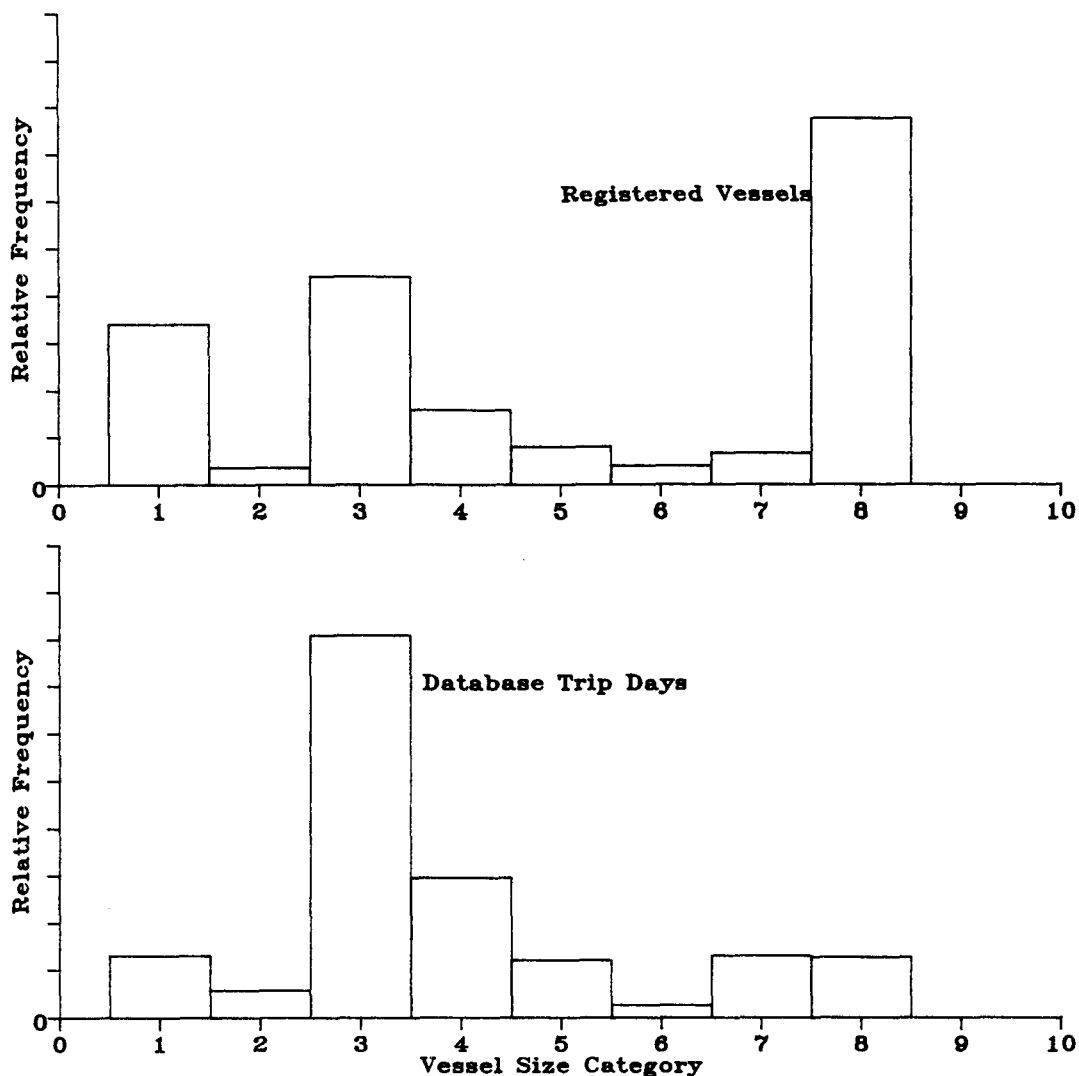


FIGURE 3. Relative frequency of vessels (upper panel) and trip days within the South Pacific Commission data base (lower panel) grouped by 8 vessel size categories. The categories 1-8 correspond to the tonnages used in Figure 2 from smallest to largest.

11. Figure 5 shows the average proportion of all trips that are reported to the SPC based on the number of days reported versus the length of the entire trip. Five, ten and fifteen days were added to allow for transit times to and from the fishing grounds. Circle sizes are proportional to the number of trips that were reported. This shows clearly that the coverage of this fleet has increased dramatically and also reflects the shrinking size of the fleet.

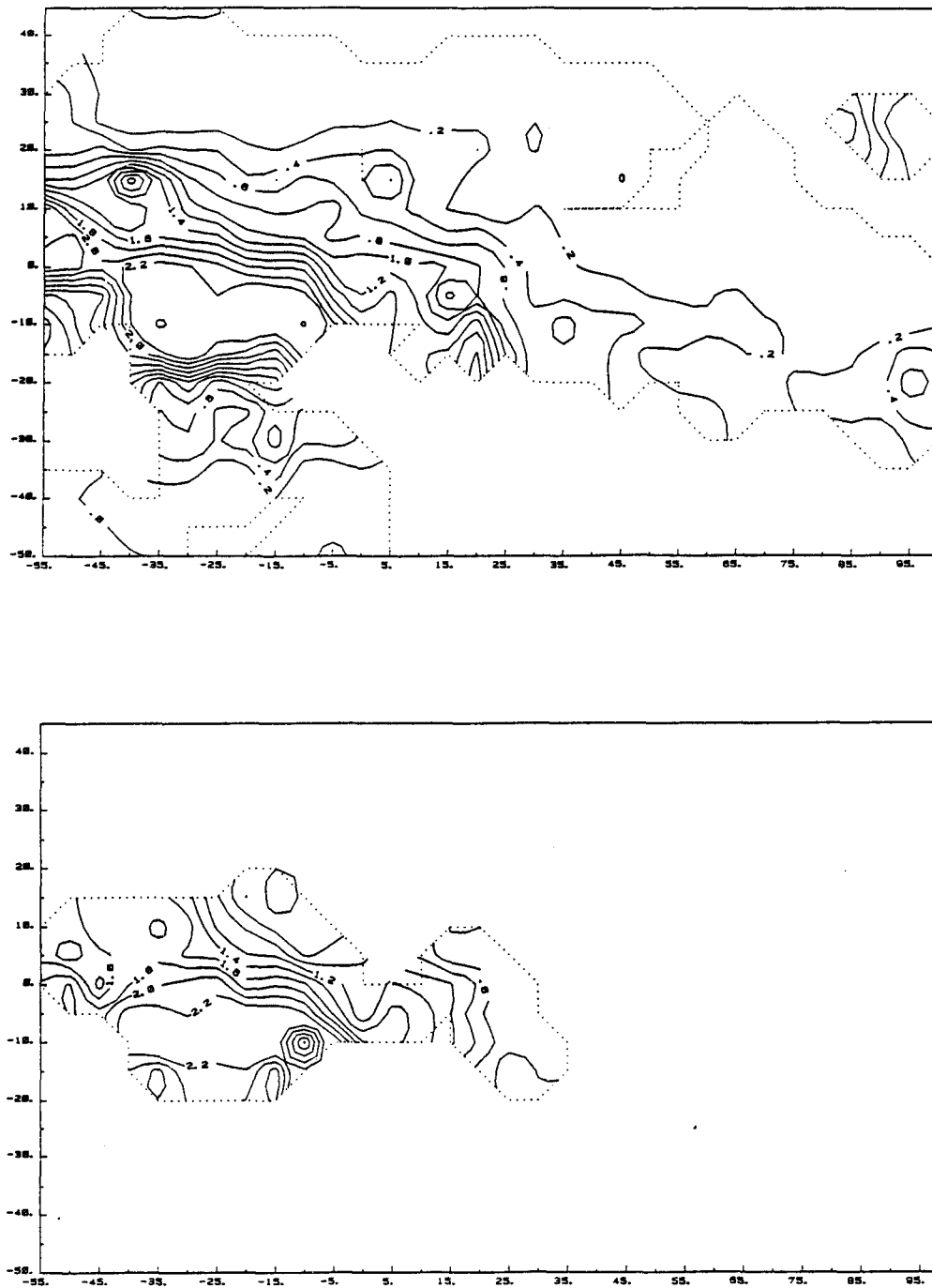


FIGURE 4. Plots of longline catch rates (isoclines) showing the extent of the information available from early published data (upper panel) and the current geographic level covered by daily logsheets. Plots are of yellowfin hooking rates. (Source :*Atlas of Longline Catch Rates, TBAP Technical Report, In Press*).

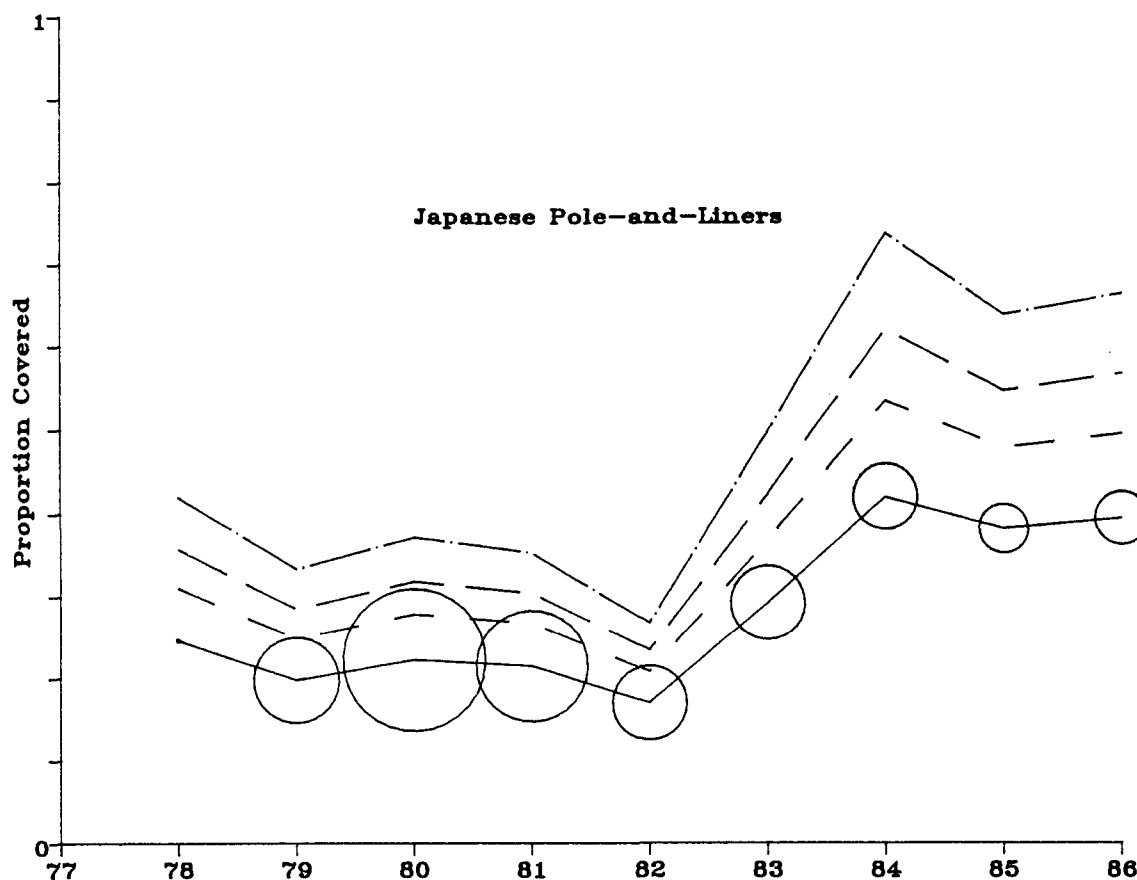


FIGURE 5. Plot of Japanese pole-and-line coverage based on numbers of days reported over the entire trip length. Lines from bottom adjust trips for 0, 5, 10 and 15 days transit to and from fishing grounds. Circles are proportional to the number of trips that were reported for each year.

12. The lack of data in the early years of reporting (1978-83) underscore a major problem in conducting more rigorous analyses on interaction and tuna movement using the extensive SPC Skipjack Programme tagging data. The problem arises in trying to interpret tag return information without having an idea of how much fishing was going on in the area tagged fish were recaptured. Understanding more about this relationship (fishing effort, catch, and tag returns) would be of great value in designing small-scale tagging studies where specific studies on interaction are desirable.

Purse Seine Coverage

13. There are 156 registered purse seine vessels operating in the region representing 133,200 tonnes of carrying capacity. Table 1 gives the catches by nationality that have been reported and incorporated into the South Pacific Commission's data base.

U.S. purse seine data

14. Coverage of U.S. registered vessels operating in the region is difficult to assess given that a large portion of the fleet has not in the past filled out logsheets that are submitted to a regional agency. A large amount of data on US vessels has been received on a regular basis at the South Pacific Commission from the American Tunaboat Association (ATA). These data arrive on magnetic tape and are incorporated into the South Pacific Commission's data base. About half of the catch and effort data do not have positions associated with them and none of the data are associated to a vessel identification name. This creates some problems when using this data in stock assessment work because effort cannot be accurately described and some methods of standardising fishing power among vessels is not possible. Table 4 presents characteristics of data holdings received from the ATA. On examining results for 1984, it appears that some particularly good fishing areas were not reported with positions. This may be attributed to fewer number of sets per day fishing, a higher success rate per set, and proportionately less time spent searching in areas where no positions were reported. For 1985 the catch rates and set success rates are more similar between data that have position information and data which do not. With the implementation of the US multilateral treaty, lack of detailed information is no longer anticipated.

TABLE 4. Summary of purse seine data reported to SPC with and without positions by U.S. flag vessels for 1984 and 1985. Catches in metric tonnes.

	1 9 8 4		1 9 8 5	
	<i>With Positions</i>	<i>Without Positions</i>	<i>With Positions</i>	<i>Without Positions</i>
Total annual catch	42%	58%	53%	47%
Av. catch/day fishing and/or searching	14.6	19.6	15.9	16.8
Av. no. sets/day fishing	1.3	1.1	1.3	1.3
% of days spent searching	45%	32%	45%	38%
Set success rate	69%	83%	62%	64%
Av. catch per successful set	29.5	30.5	35.2	32.1

Trip Length vs. Reported Days

16. As with the analyses for longliners and pole-and-line vessels, data on purse seine trip lengths and the number of days for which information was recorded were used in assessing the level of coverage. Figure 6 shows the level of coverage for the Japanese purse seiners and all other purse seine vessels (excluding US flag vessels) with 0, 5, 10, and 15 days of transit time to and from the fishing grounds. Circle sizes are proportional to the number of trips reported for each year. There is a marked improvement in coverage up until 1983, after which time the proportion of fishing that is reported versus the total trip days levels off. The number of trips reported also becomes more constant suggesting that the level of reporting is quite good. The lower panel of Figure 6 shows that coverage for vessels of nations other than the US and Japan also appears to be good. The proportion of days which have been reported on logsheets versus the number of days in a trip is as high as the coverage reported by Japanese purse seiners.

17. While it is well known USSR vessels are fishing in the region, to date, no report of their activities has been forwarded to the South Pacific Commission. Earlier this year the South Pacific Commission produced logsheet forms translated in Russian which have subsequently been dispatched within the region.

Vessel Fullness

18. As presented in SPC/Fisheries 18/WP.5, purse seine coverage can also be assessed by examining how full a vessel is (based on reported retained catch) relative to the vessel's fish hold capacity. We make the assumption that a boat will usually stay fishing until it is nearly full. The catch of individual vessels on a given trip was related to the vessels storage capacity as listed in the Forum Fisheries Agency register of vessels. Annual averages of vessel fullness at the end of each trip, along with the proportion of trip days that were reported by Japanese purse seiners is given in Figure 7. Circle sizes are in proportion to the number of trips for which a report was received. There is a strong correspondence between the two methods of estimating overall coverage of the fleet. The largest discrepancy between the methods occurs in 1982. This may be attributed to early problems encountered with misunderstandings of how logsheets were intended to be filled out.

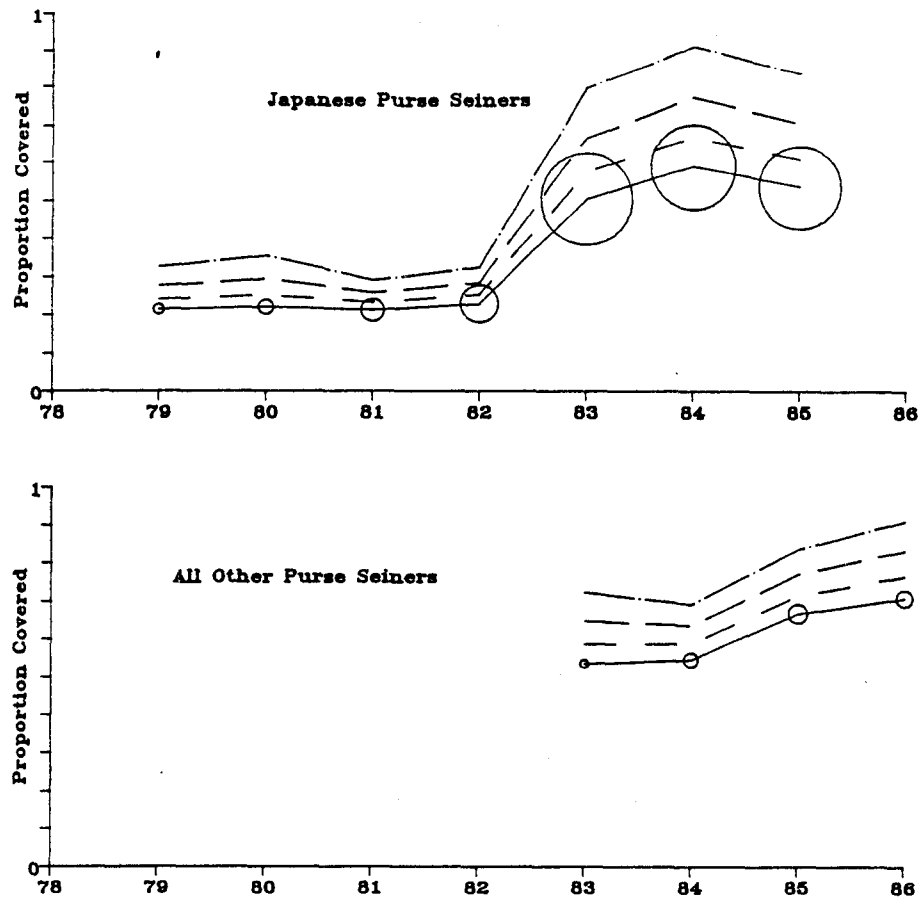


FIGURE 6. Coverage for Japanese purse seiners and all other purse seine vessels (excluding US flag vessels) with 0, 5, 10, and 15 days of transit time to and from the fishing grounds. Circle sizes are proportional to the number of trips reported for each year.

18. On a trip by trip basis, vessel fullness was plotted against adjusted proportions of days covered for the same trip (Figure 8). There is a large amount of variability in the relationship between the vessel fullness and trip days covered, however, the two are significantly correlated. This variability can be partly explained by problems with logsheet design. The definition of a trip is taken to mean several different things by different parties. A boat out of Japan may consider its trip as the time from the day it departed from Japan until the day it returned, not counting how many times it unloaded catch at transshipment ports in between. This fact would explain the lower right hand points in the scatter plot (Figure 8) where the total catch exceeds the registered carrying capacity of the vessels. The South Pacific Commission has sought to remedy these types of errors by improving the design of the logsheet reports, enabling more flexibility by allowing space for recording intermediate unloading ports. Unfortunately, the implementation of these logsheets has progressed slowly.

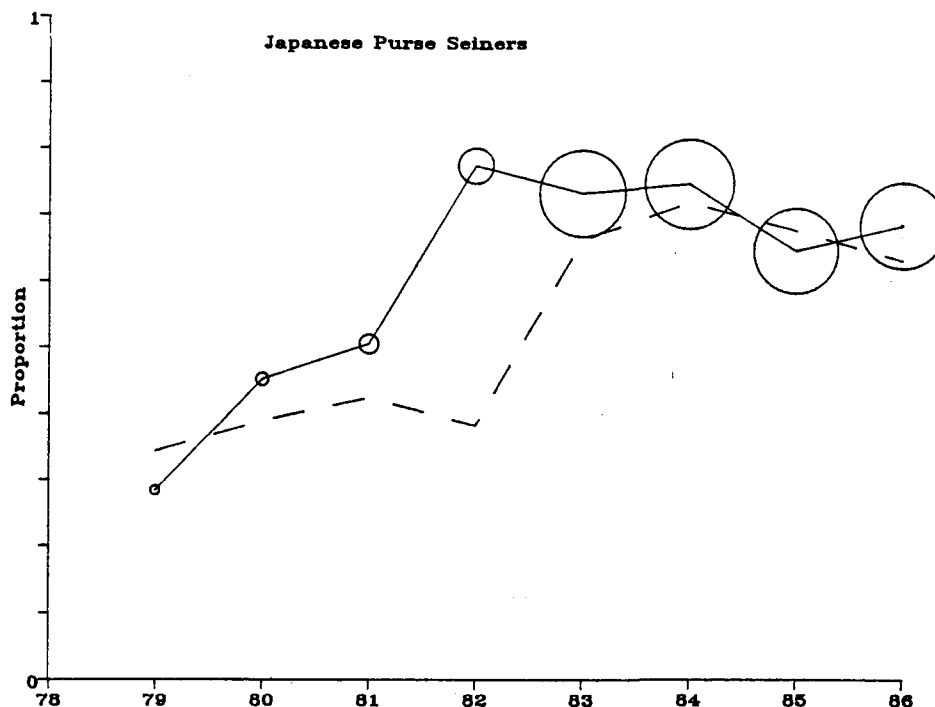


FIGURE 7. Annual averages of vessel fullness at the end of each trip (solid line) and the proportion of trip days (adjusted to allow 5 days of transit to and from the fishing grounds) that were reported (hashed lines) by Japanese purse seiners. Circle sizes are in proportion to the number of trips for which a report was received.

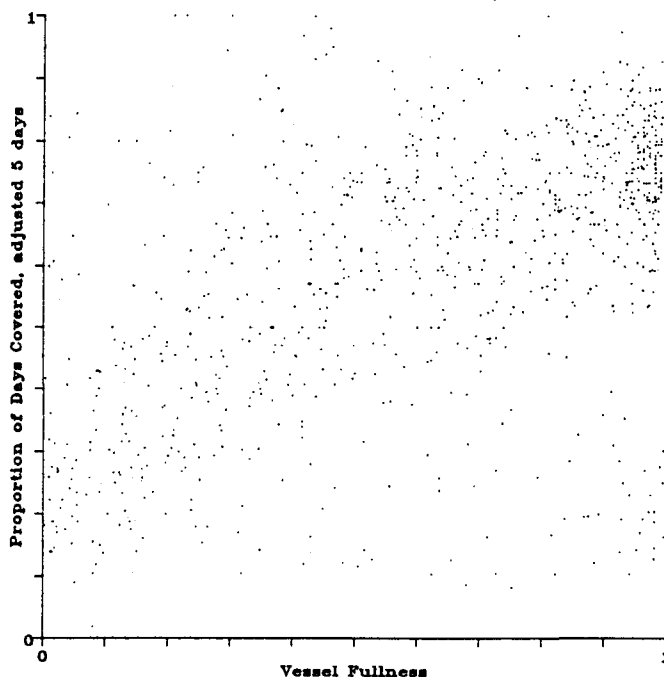


FIGURE 8. Plot of proportion of days covered versus vessel fullness for individual trips. Trip lengths were shortened by five days to allow for transit time to and from the fishing grounds. Correlation coefficient, r , equals 0.56 and is significant at 95% confidence level.

Summary

19. Analysis on the coverage of catches made by longline vessels indicate there is serious under-reporting by Taiwanese and Korean flag vessels. Many of these vessels unload their catch within the region and some data are now being collected by outside agencies. Limited amounts of data from these agencies have been submitted to the South Pacific Commission. Measures to secure these data as well as encourage more reporting on logsheets through access agreements are needed for the Korean and Taiwanese fleets. One course of action that may improve the coverage of these fleets would be for the region to agree on an aggregated format of catch data for release to other agencies in exchange for data that the region currently does not receive.

20. The Japanese fleet of longline vessels currently appear to be well covered by the logsheet system. By size groups, vessels larger than 150 gross registered tonnes have a low rate of coverage. This is presumably due to the long-range capabilities of these boats which only spend a small portion of their time fishing within the region. Whether or not this is true warrants further investigation beyond the scope of this presentation. The geographic coverage of the fleet's catches has shrunk considerably since published data became no longer available after 1980.

21. The pole-and-line fleet coverage has improved dramatically since 1982 and currently has levelled off to between 75-80% reported. These vessels spend a significant portion of their trips in international waters and in areas where tuna are not declared within jurisdiction of the Extended Economic Zone. These areas still represent serious gaps in the data base and limit analyses on stock assessments. The early data between 1979 and 1982 indicate that a very significant portion of the catch in the region has not been reported to a regional agency. This information is particularly critical for more detailed interaction studies using the large tagging data base of the South Pacific Commission Skipjack Survey and Assessment Programme.

22. Data have been supplied to the SPC on catches made by U.S. flag boats by the American Tunaboat Association for the years 1984-85. About half of these data contain information on the position where catches were made and none of the data supplied have information on the vessel which made catches. This information greatly adds to the regional data base, however, the level of detail needs to be improved. The implementation of the U.S. multilateral treaty should provide the coverage necessary to improve assessment capabilities. The Japanese fleet of purse seine vessels appears to be well covered since 1983 based on the portion of trips that have been reported and trip catches relative to vessel carrying capacity. No data on catch made by vessels of the Soviet Union have been reported to the SPC for incorporation into the regional data base. Purse seine vessels of nations other than those mentioned above have coverage on par with the Japanese fleet based on the proportion of trips that have been reported.

23. Coverage of the principal fleets fishing in the region is as good as can be expected with current arrangements. Improvements to the Regional Pelagic Fisheries Data base will now come from doing active field work at unloading sites (SPC/Fisheries 19/Information Paper 2), negotiating more regional multilateral agreements that will include total trip coverage, thereby including "high seas" data, encouraging countries and agencies involved with the region's pelagic fishery to submit catch information, particularly those that do not presently do so, and continuing to gather historical data from the region.

30 July 1987

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SOUTH PACIFIC COMMISSIONNINETEENTH REGIONAL TECHNICAL MEETING ON FISHERIES

(Noumea, New Caledonia, 3-7 August 1987)

UPDATE OF SPC's DWFN CATCH COVERAGE IN THE SPC REGION

(Paper prepared by the Secretariat)

CORRIGENDUMPage 2, Table 1

Addendum to Table caption:

"NOTE: Totals may not add up exactly due to rounding."

Purse Seine (Japan)	<u>1981</u>
should read	27500

Pole-and-line totals	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
should read	46000	39000	22600	47200	33900	21800	55400

Longline total	<u>1981</u>
should read	27500

Page 16, line 3

Reference should read (SPC Fisheries 19/Working Paper 19)