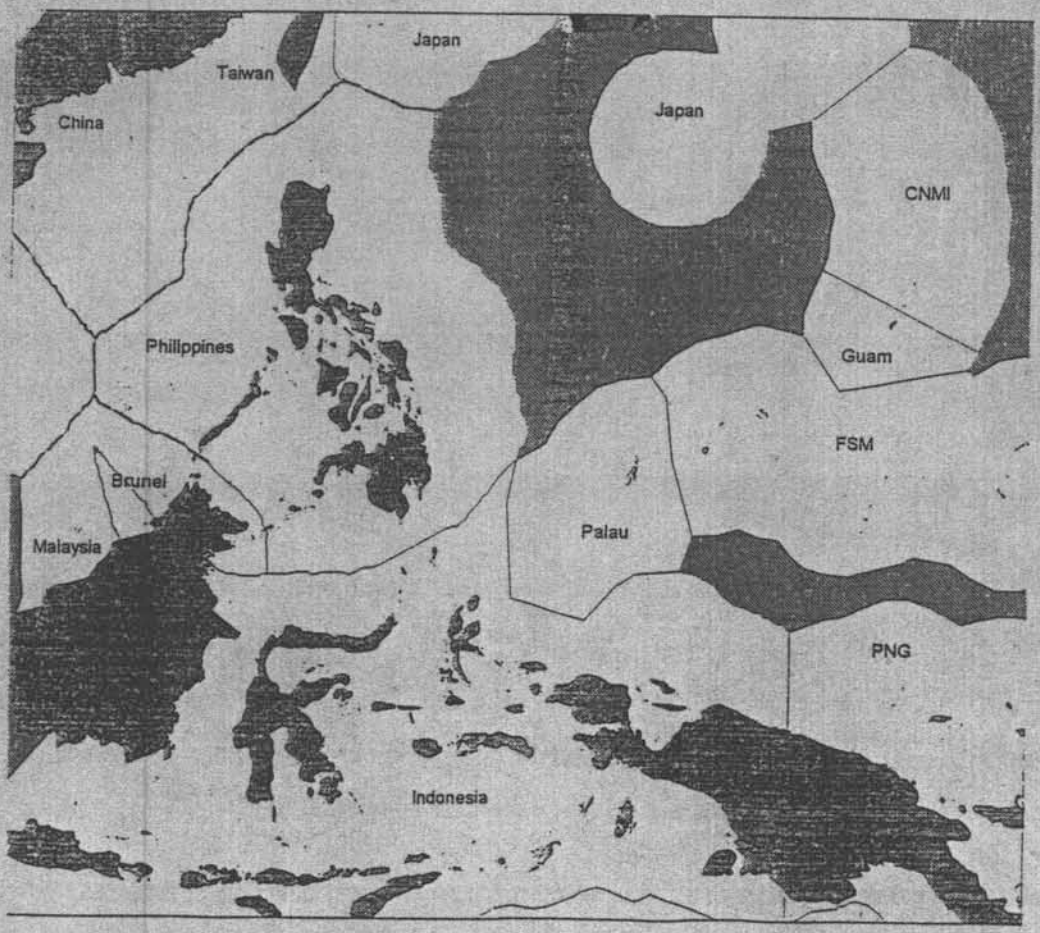
DISTANT WATER FISHING NATION (DWFN) ACTIVITY IN THE PHILIPPINES EEZ - A REVIEW

DESK STUDY FOR THE PHILIPPINES TUNA RESEARCH PROJECT (PTRP)



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EXECUTIVE SUMMARY

Available catch and effort data, combined with landings data and other relevant information, have been assembled for an area approximating the Philippines EEZ (5° N to 20° N, 115° E to 130° E), to examine the potential for the development of tuna fisheries, particularly longline fisheries, outside areas presently heavily exploited by domestic tuna fleets. The SPC Regional Tuna Fishery Database has been the primary source of data, although coverage of fleets operating in the study area is far from complete. Little or no data have been collected in the Philippines, primarily due to the historical absence of access arrangements with DWFNs active in the area.

Whilst there appears to be little potential for the further development of surface fisheries (purse seine, pole-and-line) in the Philippines Sea, some potential probably exists in the South China Sea, where however other political factors preclude expansion of current fishing areas.

The potential of the longline fishery has long been proven, with DWFN fleets active in the area for nearly sixty years. The most complete data are for the Japanese distant water fleet, which however took less than 2,000t per year during 1962-1980, before declining to very low levels since 1980. Very little activity has apparently occurred in the area at any time by the Korean and Taiwanese distant water fleets. Much larger catches have been made in the past by the Taiwanese offshore longliners, which may have taken up to 36,000t from the area in the peak year of 1975, and to a lesser extent, the Japanese offshore longliners. Few detailed catch/effort data are available from either offshore fleet, but some inferences are made about their operational aspects from information in adjoining areas, and from a study of the Taiwanese fleet in the early 1980s. Little or no data were available to the study from domestic longliners currently operating in Philippines waters.

The longline fishery in the study area has, and continues to be, a yellowfin fishery, with minor bigeye catch, and considerable amounts of by-catch. Seasonal shifts in effort between the Philippine Sea and South China Sea occur in accordance with the monsoons. There is no marked seasonal variation in catch rates; yellowfin catch rates appear slightly higher in the Philippine Sea, and bigeye catch rates higher in the South China Sea.

Several major changes have occurred in the fishery with respect to the study area during the last 15 years. Firstly, the relocation of the larger Japanese vessels out of the area in the early 1980s as targeting shifted to bigeye, and the fishing area changed. Secondly, in more recent years, the relocation of one quarter of the Taiwanese offshore fleet to areas further east in Micronesia. This may have accompanied an apparent decline in landings in Taiwan ports (now approaching historical lows), and a decline in the proportion of yellowfin in the catch. In the absence of any time series of detailed catch and effort data for the offshore fleets, it is difficult to ascribe a clear reason for this, but the possibility of local depletion of yellowfin stocks, especially as the Philippine domestic handline fishery has developed, and lower than average bigeye catches relative to other western Pacific areas must be considered.

The main questions relative to the development of a viable local longline fishery would seem to be economic, and possible interaction with handline fisheries in some areas; some opportunities for improved operational efficiency are suggested.

1. INTRODUCTION

This review examines levels and patterns of tuna fishing activity by the so-called Distant Water Fishing Nations (DWFNs) in the waters of the Philippines, based primarily on catch and effort data held on the SPC Regional Tuna Fishery Database (RTFD), published statistical summaries where these are available, and relevant fisheries literature. DWFNs, in this context, will include Japan, Taiwan (Republic of China), the Republic of Korea (ROK), the Peoples' Republic of China (PRC), and the United States, but with some mention made of other South-East Asian coastal states which are potentially DWFNs.

For the purpose of this review, Philippine waters, or the Philippine EEZ, are defined as in Figure 1, even though it is recognized that these boundaries may not be accepted by all states. For statistical purposes (data from the RTFD and other sources are aggregated by one degree or five degree square), the area is defined as bounded by 5° and 20° N, and 115° and 130° E ie 9 five degree squares.

The Philippines EEZ has long attracted the interest and attention of DWFNs because of its proximity to their operational bases, its relatively productive waters, and the absence of a sizeable local tuna fishery until the 1970s. The Phillipines EEZ adjoins that of Taiwan in the north, that of Japan in the north-east, East Malaysia and Indonesia to the south, with an area contested by numerous states to the west, ie the South China Sea (SCS). Longliners of both Japan and Taiwan have been active in the SCS and what is now the Philippines EEZ since the 1930s (Kume, 1973); in the late 1960s, Japanese long-range pole-and-line vessels apparently began to fish in the area, and it is likely that a small Taiwanese domestic pole-and-line fishery took some of its catch here also. Purse seine activity, more recent in origin, seems however to have been limited.

As the review is intended to provide background information for an exploratory longline program in the northern part of the Philippines EEZ, and as the main type of DWFN fishing activity within the area appears to have been longlining, the focus of the review is on longline catches. Catches by all gears are reviewed however, as is the present status of the tuna fishery in the wider Western Tropical Pacific (WTP), and the Philippines domestic tuna fishery.

2. SOURCES OF DATA

The primary source of data for the review, as noted, is the RTFD. Daily catch and effort logsheet data provided by DWFNs under access arrangements or by domestic fleets, are maintained in confidence on the database. In aggregated form, these are combined with aggregated catch data provided from other sources, including USA, Japan, Korea, and Taiwan (see 1994 Data Catalogue for further details), as well as size composition, unloadings and tagging data. In the case of longline, catch data are available by 5° square/month, and for other gears (pole-and-line and purse seine) by 1° square/month. Data coverage, in general, is relatively low prior to 1975, but it has been since that time that tuna catches in the WTP have increased dramatically.

As the RTFD is maintained primarily on behalf of SPC member states, coverage of fishing activity in non-SPC member states eg Philippines, is usually less complete. Furthermore, the western part of the Philippines EEZ, ie the SCS, lies outside the normal SPC area of competence, and statistical coverage of some fleets, notably the Taiwanese offshore (cf. distant water) longline fleet, based in southern Taiwan ports, and the Japanese offshore longline fleet, is poor on the RTFD. In these cases, other published sources of data have been used, eg the Fisheries Yearbook, Taiwan.

Figure 1. Map of the Philippines showing 200 mile boundary (dark shading) and area used for extraction of catch data for this study.

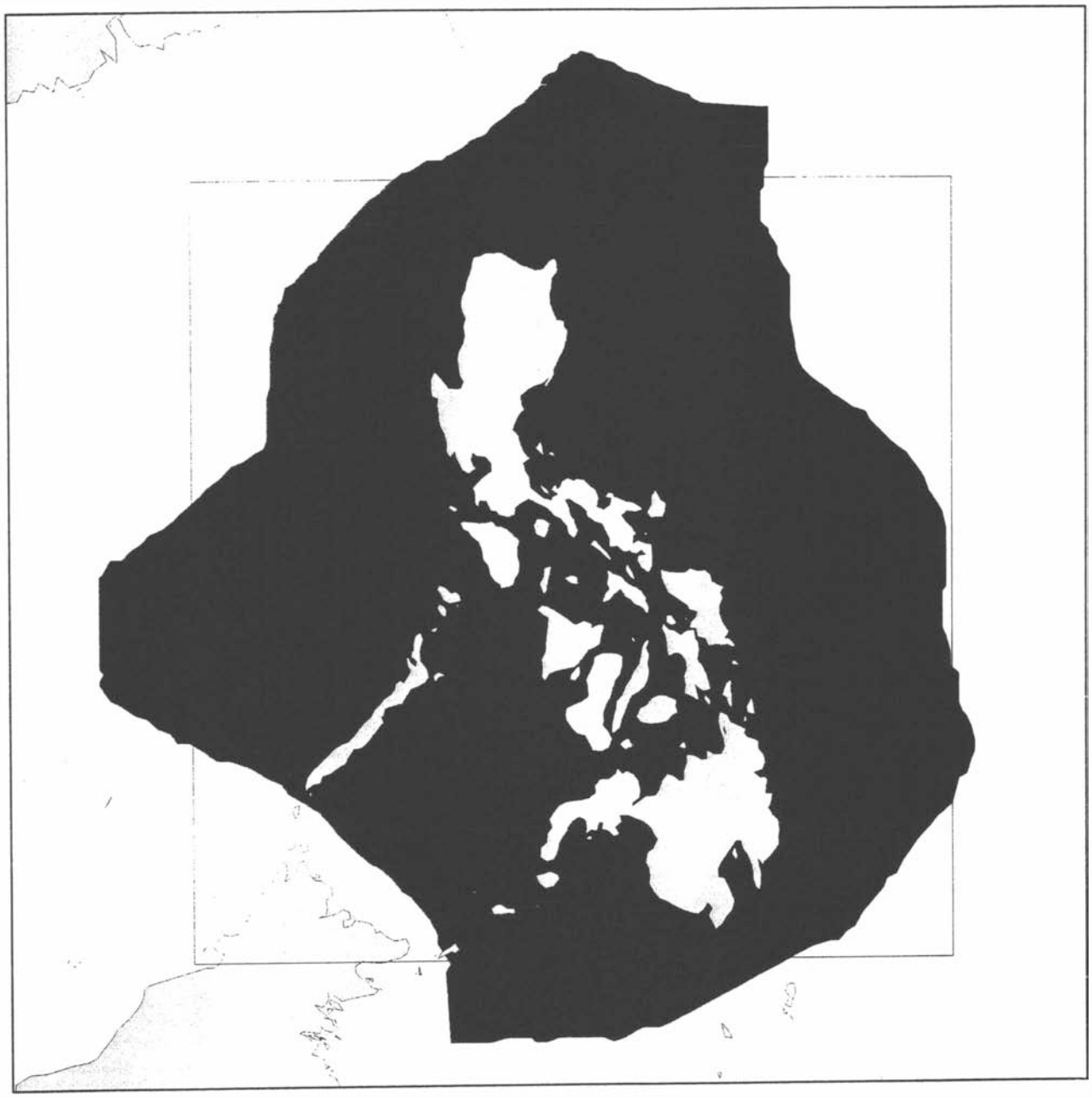
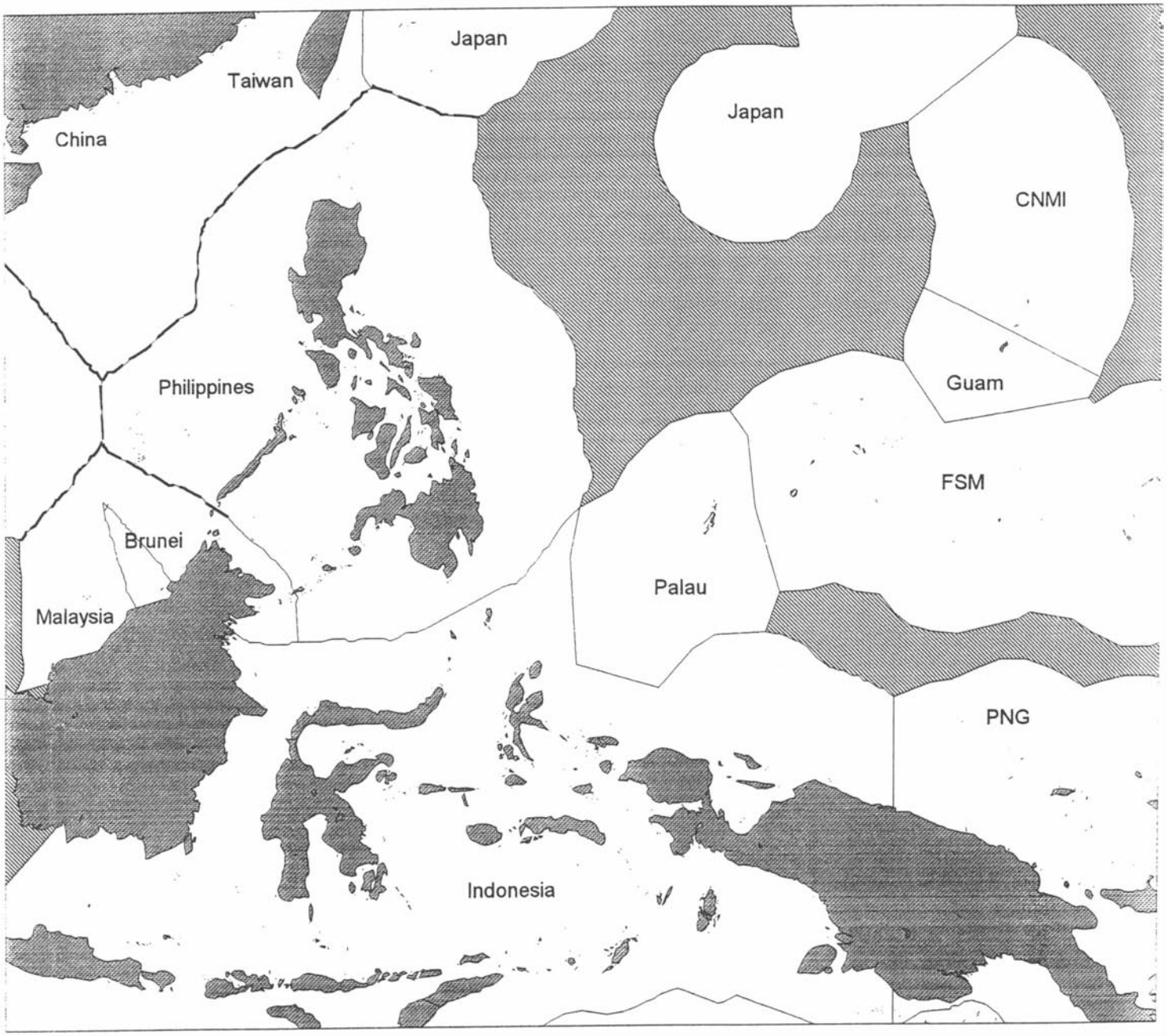


Figure 2. The Philippines EEZ and adjacent waters. High seas areas are shaded.



Two other factors contribute to the relatively poor data coverage of the study area. Firstly, the Philippines seems never to have entered into bilateral access arrangements, despite the long history of foreign fishing in its waters, even continuing post-UNCLOS. Such arrangements usually require the submission of detailed daily catch/effort logsheet data as a condition of access, and are an important, if not fundamental source of fisheries data for coastal states. Secondly, much of the Philippines Sea is high seas (see Figure 2), and data coverage is reduced accordingly, since submission of adjacent high seas data has hitherto not been required as a condition of bilateral access.

As will become clear, there are however sufficient data to draw useful conclusions about the history of DWFN fishing activity in the study area, and the prospects for development of domestic tuna fisheries of several types.

3. TUNA FISHERIES IN THE WTP

Tuna fisheries in the western tropical Pacific (the SPC area, plus eastern Indonesia and the Philippines) now provide an annual catch of approximately 1.3 million tonnes of the primary market species of tuna (skipjack, yellowfin, bigeye, albacore), another 300,000t of secondary species (*Auxis, Euthynnus)*, plus billfish and a variety of non-target species (SPC Tuna Fishery Yearbook 1993). Three gear types - purse seine, longline and pole-and-line - are responsible for the great majority of the catch, but with a variety of artisanal gears important in both Indonesia and the Philippines.

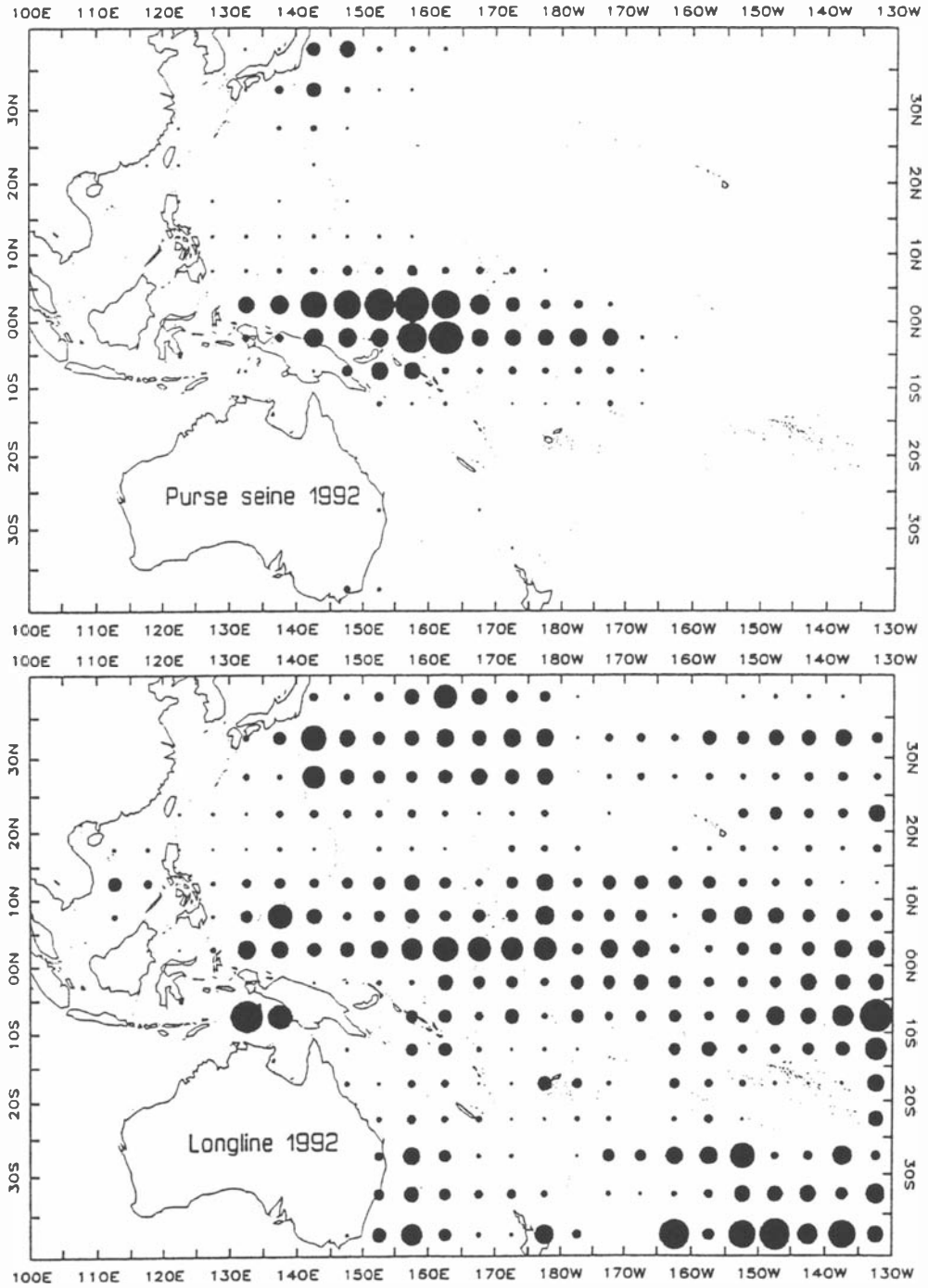
Purse seine fisheries provide the bulk of the catch in both the SPC area (80%) and the WTP (67%). Skipjack comprise the majority of the purse seine catch (70%), with yellowfin and a small quantity of juvenile bigeye tuna the remainder. The spatial distribution of the purse seine catch is shown in Figure 3, with most of the catch taken between 10°N and 10°S, eastwards to 150°W, but with relatively little of the catch west of 135°E ie imediately adjacent to the Philippines EEZ. Not shown are catches by the domestic ring net/purse seine fishery of the Philippines, which takes approximately 80,000t of skipjack and yellowfin, primarily in southern regions. The catch in the SPC area has been relatively stable since peaking in 1991 following the dramatic expansion during the late 1980s.

The **pole-and-line** fishery has domestic components (Indonesia, Solomon Islands, Fiji) and also a Japan-based distant water component. Catches from this fishery are generally declining (67,000t in 1993 (SPC area), down from over 200,000t in the early 1980s). Skipjack comprise over 90% of the pole-and-line catch.

The **longline** fishery catch in the SPC area during 1993 was approximately 120,000t, but it is the most valuable component of the regional tuna catch, rivalling the much larger purse seine catch in landed value. The overall tuna species composition is approximately 40% bigeye, and 30% each of yellowfin and albacore, but varying by area and fleet. Longline catches involve several vessel/operational types - large distant water vessels which undertake long trips (months) and freeze and store their catch onboard, and smaller vessels operating from bases relatively near the fishing grounds, which make short trips (days/weeks) and chill the catch for eventual delivery to fresh/sashimi markets. The former involve primarily vessels of Japan, Korea and Taiwan, whereas the latter involve vessels based in a number of coastal states in the region, as well as vessels based in Taiwan and Japan. The number of these offshore sashimi vessels has been increasing rapidly in recent years, particularly with the entry of large numbers of PRC vessels into the fishery. Longline catch is more widely distributed throughout the region than is the case for the purse seine fishery (Figure 3).

Figure 3

Distribution of purse seine and longline catch in the western Pacific, 1992, by five degree square.



4. THE PHILIPPINES TUNA FISHERY

A recent review of Philippine tuna fisheries was provided in the PTRP Final Report, and is not repeated here. Total catches (all species) have exceeded 300,000t since 1989, with skipjack and yellowfin/bigeye comprising approximately 60% of that total. Commercial operations (150-190,000t) involve mostly ring net/purse seine gear (85% of commercial landings), whereas municipal operations involve significant catches by a variety of gears, with handline and hook-and-line contributing 56% of municipal landings. A limited amount of domestic longlining occurs, usually on a small scale (average annual catch 4,200t, 1978-1987). At least two companies have domestic longline operations, involving possibly 10 vessels, although no details are available. Kume (1973) also refers to a tuna longline survey carried out between 1957-1960, mainly in the Sulu Sea, and with yellowfin dominating the catch; there has been no pole-and-line fishing since pre-war days, when there was a small base in Zamboanga. An annual catch of 1,520t was recorded in 1937.

The increase, particularly in commercial production, has occurred almost entirely since 1972. Catches are widely distributed throughout the country, but with 60% of total landings coming from the waters surrounding Mindanao. The least activity occurs in northern waters. Operational aspects and seasonality of catches are strongly influenced by the monsoons, with fishing activity restricted on the east coast during November to May by the northeast monsoon, and activity on western coasts restricted by the southwest monsoon during June-October.

5. DISTANT WATER FISHING NATION ACTIVITY IN THE PHILIPPINES EEZ

5.1 PURSE SEINE

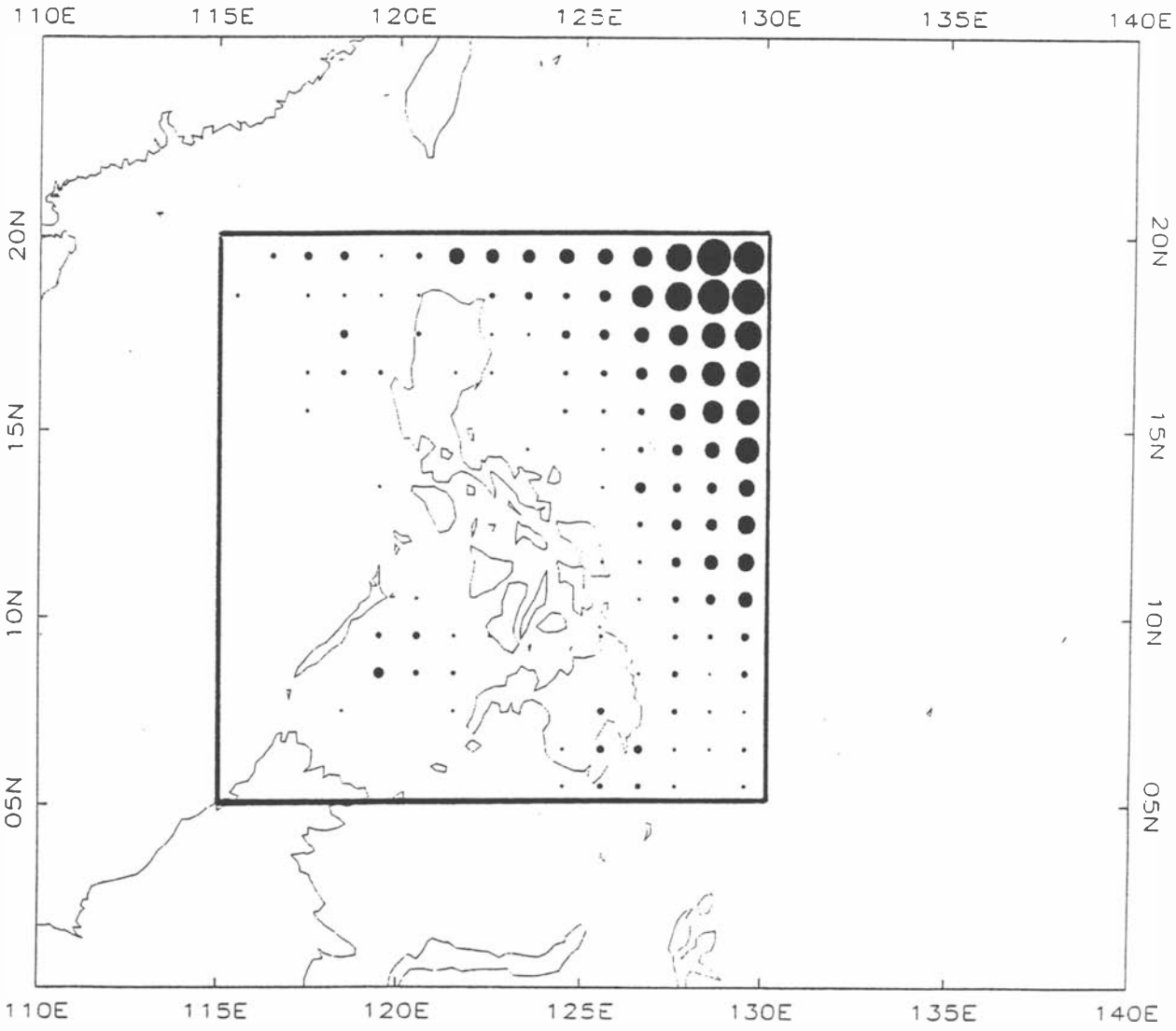
Despite the dominance of tuna catches in the WTP by purse seine, very little of the DWFN activity occurs in or adjacent to the Philippines EEZ. Examination of all available data on the RTFD (Japan purse seine from 1967 onwards, ROK and Taiwan purse seine from the early 1980s and US purse seine from 1979) shows a total catch of only 50t from 121 days of recorded effort, in the 5° - 20° N, 115° - 130° E area, with all recorded effort east of 120° E . The extremely low catch per day recorded (120 days with no catch) suggests that the abundance of suitable surface shools in this area is low. This is also consistent with the very poor sightings of surface schools in Philippines Pacific coast waters by the Regional Tuna Tagging Project (RTTP)/PTRP tagging vessel on two separate surveys, and apparently unsuccessful attempts by Philippine commercial purse seine companies to operate seasonally in the Philippine Sea. This area is additionally subject to strong currents, the northern branch of the North Equatorial Current which becomes the Kuroshio, and the strong-flowing southern branch, the Mindanao Current, which can flow at speeds of up to two knots. These currents additionally overly the deep Mindanao Trench, with maximum depths of over 10,000m. These great depths are attained quite close to the Pacific coast of the Philippine Islands, also precluding the deployment of payaos for use by purse seiners in areas other than close inshore.

It would therefore seem, based on the available empirical evidence, that the potential for purse seine fishery development in the Philippines Sea, involving either payao deployment or location and capture of unassociated tuna schools, is limited.

The SCS situation is not considered, given other political factors which pertain, but Philippine purse seine vessels have fished seasonally in this area for some years (usually during the first half of the year). Catch data for these operations were however not available for consideration.

Figure 4

Japanese distant water pole-and-line effort in the study area, by one-degree square, 1972-1992.
(The largest circle represents only 300 days effort)



5.2 POLE-AND-LINE

Examination of aggregated effort data (one degree square/month) for the Japanese distant water pole-and-line fleet for a twenty year period (1972-1992) again shows very little activity in the 15 degree by 15 degree area, except for the north-east corner which lies outside the nominal EEZ (Figure 4). Even in this area, activity has been seasonal and limited, with the maximum days effort in any one degree square over the twenty year period of 300 days, ie 15 days per year, on average. Activity has been restricted mainly to the northern winter months, ie October to March, the off-season for the home water fishery of Japan, but also normally a period of bad weather associated with the prevailing north-east monsoon. Elsewhere, virtually no effort is recorded, and at least some of the small amounts of recorded effort in internal waters (one or two days, in most cases) seem to be data entry errors.

This picture of limited pole-and-line effort directed to the area is consistent with that for purse seine, since both rely on the location of surface schools of tuna. Combined with the fact that there has been no domestic pole-and-line activity in Philippines since 1940, it is again concluded on the basis of the evidence that there is little or no potential for pole-and-line fishery development in the Philippine Sea. The difficulties of obtaining adequate supplies of live bait in heavily exploited coastal waters by the RTTP/PTRP vessels would reinforce this conclusion. The potential in the SCS may be better, but no information currently exists to enable this to be assessed.

5.3 LONGLINE

Data from the following longline fleets need to be considered in this review, all being active in the study area to varying degrees :-

(1) Japan distant water longline (large conventional vessels; freeze catch onboard)

(2) Korea distant water longline "

(3) Taiwan distant water longline "

(4) Japan offshore longline (small vessels, < 50GRT; chilled fish)

(5) Taiwan offshore longline "

(6) China offshore longline

(7) Other longline

For the distant water longline fleets of all three nationalities, published book data (five degree square/month) are available for the WTP, including the study area. For the offshore vessels, detailed catch and effort statistics are generally not collected or compiled at the national level, but rather at the prefectural level (Japan) or not at all (Taiwan). Either way, coverage is far from complete for these vessels which potentially account for much of the activity in the study area because of their limited operational range. Data have therefore been collected from a variety of available sources, including published landings data of unknown accuracy (and no inforamtion on area fished), data provided under bilateral access arangements in adjacent areas (notably Palau), and other unpublished sources.

5.3.1 Japan distant water longline

Although there is a centuries-old history of longline fishing in Japanese home waters, it was not until the 1930s that distant water operations in the western Pacific began, following the establishment of canneries and mothership operations. In 1931, a cannery was established in Palau, and by 1939, 72 longliners were fishing in the WTP, as far east as 170° E. These were in addition to the smaller offshore longliners based in Taiwan, fishing the SCS and waters east of the Philippines. Re-establishment of the distant water fishery after the war proceeded in phases, as restrictions by the allied powers were progressively relaxed. By 1964, the distant water Japanese fleet was operating over most of the Pacific, often in conjunction with bases established in various Pacific islands, including Palau (1962).

A large amount of published data is available for the activities of this fleet in the study area for the period 1962 - 1992 inclusive. These data are tabulated as Appendix Table 1, which lists for the total area, by month for each year, the number of hooks deployed, the tuna catch (tonnes) and catch rate (fish per 100 hooks) for yellowfin and bigeye, the target species, and the total catch and catch rate. Table 1 lists annual reported catch by species, including non-tuna species. A total catch of nearly 42,000t, taken by 73 million hooks was reported for the study area during the thirty year period.

Effort levels in the area peaked first in 1969, at 6,300,000 hooks and a catch of 2,700t total (67% yellowfin), then again at a higher level in 1975 (8,534,000 hooks, 5,336t, of which 75% was yellowfin) (Figure 2). Effort and catch declined sharply after this time to virtually zero during the 1980s; in both 1986 and 1988, the annual catch was less than five tonnes, with the average annual catch for the period 1981-1992 only 77.9t, as opposed to the average annual catch of 1908t for the period 1962-1980. The slight increase seen in 1992 (669,800 hooks, 205t, 73% bigeye) appears to be due to the inclusion of some offshore longliners in the distant water data set for the first time (see later). The decline in effort during the 1980s is almost certainly related to a shift to targeting bigeye tuna at this time, by the setting of deeper hooks, and a resultant fleet movement to areas where bigeye are more abundant (or fish quality was better).

The spatial distribution of effort, by five degree square, is shown for each year (1962-1992) in Appendix Figures 1 to 6. Although total effort is widely distributed in most years, the two five-degree squares between latitudes 10°N and 15°N (SCS - 115° to 120°E, and Philippines Sea - 125° to 130°E) attract most effort (see years 1967-68, and 1973-1977).

The catch by five degree square/year for yellowfin and bigeye (numbers of fish) shows a similar pattern, but with yellowfin catches tending to be larger on the Philippine Sea side, and bigeye catches larger on the SCS side.

Catch rates over time (fish per 100 hooks) are shown in Figures 4 and 5, for yellowfin and bigeye respectively. The yellowfin catch per unit effort (CPUE) shows considerably more stability over time than is the case for the WTP, where CPUEs fluctuated before reaching a high in the late 1970s, and have declined steadily since that time (Hampton, 1994). The Philippines CPUE has, in contrast, been rather stable until 1980, after which time a decline is evident; effort levels were however very low, as noted, during the 1980s, and this apparent decline may not be significant. Absolute catch rates for yellowfin were also higher in the study area than in the WTP for the 1960s and 1970s. Bigeye catch rates were much lower (approx one third that of yellowfin), but appear to show some increase from the mid-1980s onwards. Although effort levels are low during this period, this improvement in CPUE is presumably related to targeting practices.

Table 1

Catch statistics for longline vessels fishing in the Philippine study area (catch in metric tons)

Flag : JP

Year	Hundreds of Hooks	Skj_c	Yft_c	Alb_c	Bet_c	Bft_c	Mls_c	Bum_c	Blm_c	Swo_c	Sai_c	Shk_c	Oth_c
62	21114	0.000	784.893	11.160	269.021	10.007	41.120	47.615	19.582	32.060	0.000	0.000	121.590
63	22785	0.000	609.730	102.937	237.967	9.966	36.346	27.445	18.821	39.871	0.000	0.000	223.377
64	18096	0.000	766.935	25.132	158.418	23.685	19.019	78.003	10.929	22.491	0.000	0.000	138.866
65	29760	0.000	1146.654	31.722	293.579	15.937	32.034	64.266	23.552	38.684	0.000	0.000	92.003
66	31932	0.000	1188.597	9.147	406.602	14.081	16.479	71.611	29.865	40.247	0.000	0.000	83.939
67	36510	0.000	1376.566	15.096	551.353	8.192	25.103	55.603	29.633	57.104	0.000	0.000	90.713
68	47762	0.000	1271.573	114.180	527.013	3.913	30.263	65.585	29.402	46.075	0.000	0.000	169.262
69	63283	0.000	1822.265	72.514	874.057	1.736	17.787	71.299	34.953	65.723	0.000	0.000	100.784
70	19232	0.000	750.527	26.598	281.992	0.202	4.235	40.948	19.113	25.332	0.000	0.000	12.263
71	14428	0.000	560.457	12.965	269.081	0.000	3.542	11.268	16.074	22.304	0.000	0.000	6.202
72	21635	0.000	895.867	55.390	436.439	0.000	18.481	17.360	15.548	34.047	0.000	0.000	9.066
73	50941	0.000	1732.011	121.549	1102.992	0.525	41.428	104.091	22.446	64.913	0.000	0.000	34.162
74	84841	0.000	3949.618	234.553	1092.060	0.242	38.657	149.203	33.496	74.907	0.000	0.000	72.865
75	85340	0.000	4009.242	58.395	1327.142	0.081	20.097	99.494	26.829	73.297	0.000	0.000	42.228
76	54213	0.000	1696.403	32.753	875.830	0.000	16.863	51.033	23.258	57.573	0.000	0.000	40.373
77	47785	0.000	1427.287	17.004	900.636	0.000	14.554	26.024	15.194	42.947	0.000	0.000	38.175
78	17230	0.000	576.992	1.384	296.681	0.000	4.389	14.892	5.432	14.723	0.000	0.000	12.025
79	12830	0.000	310.483	1.491	228.248	0.000	2.849	8.664	4.791	12.453	0.000	0.000	2.100
80	22061	0.000	970.146	1.344	281.437	0.000	8.162	12.963	6.311	13.494	0.000	0.000	5.774
81	8704	0.000	215.537	0.951	66.542	0.000	1.540	4.367	1.517	7.811	1.012	0.000	0.000
82	9423	0.000	107.399	0.835	80.016	0.000	4.543	4.537	1.168	10.890	0.748	0.000	0.000
83	2168	0.000	43.619	1.659	19.126	0.000	1.463	2.437	0.350	2.414	0.264	0.000	0.000
84	1432	0.000	26.959	0.260	12.639	0.000	0.231	1.492	0.525	2.131	0.330	0.000	0.000
85	1725	0.000	47.144	3.542	12.235	0.000	0.924	1.964	0.116	1.468	0.198	0.000	0.000
86	57	0.000	1.395	0.000	1.304	0.000	0.000	0.034	0.000	0.142	0.011	0.000	0.000
87	853	0.000	14.937	0.026	13.972	0.000	0.385	0.373	0.000	0.614	0.000	0.000	0.000
88	193	0.000	2.079	0.000	1.459	0.000	0.000	0.271	0.000	0.000	0.044	0.000	0.000
89	557	0.000	4.843	0.000	19.096	0.000	0.924	0.338	0.058	0.000	0.088	0.000	0.000
90	210	0.000	4.513	0.183	1.739	0.000	0.077	0.034	0.000	0.190	0.000	0.000	0.000
91	906	0.000	12.071	2.470	22.047	0.000	0.000	0.374	0.058	0.568	0.000	0.000	0.000
92	6698	0.000	55.031	0.013	149.879	0.000	1.155	1.016	0.759	3.313	0.000	0.000	0.000
TOTALS	734704	0.000	26381.773	955.253	10810.602	88.567	402.650	1034.604	389.780	807.786	2.695	0.000	1295.767

Figure 5. Annual Japanese longline effort in the Philippines study area

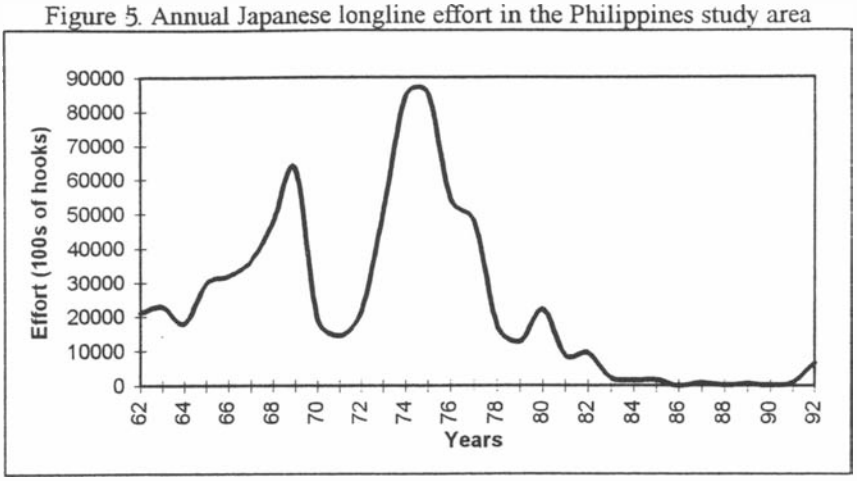


Figure 6. Annual Japanese longline Yellowfin CPUE in the Philippines study area

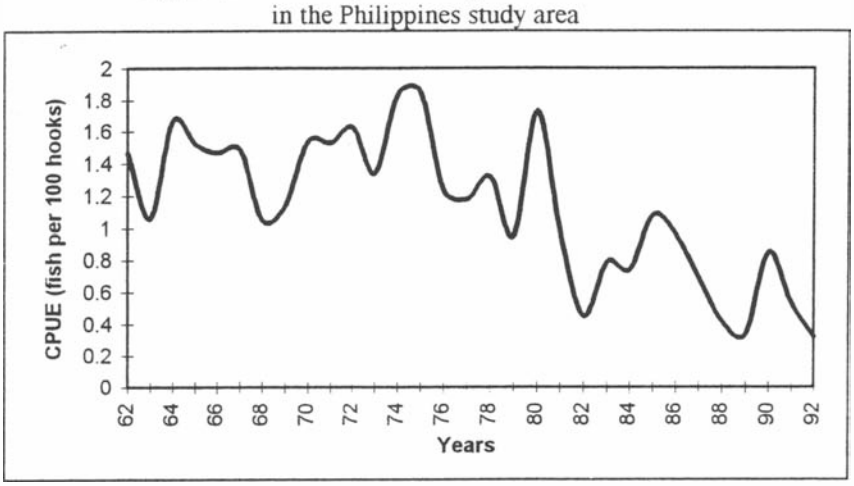


Figure 7. Annual Japanese longline Bigeye CPUE in the Philippines study area

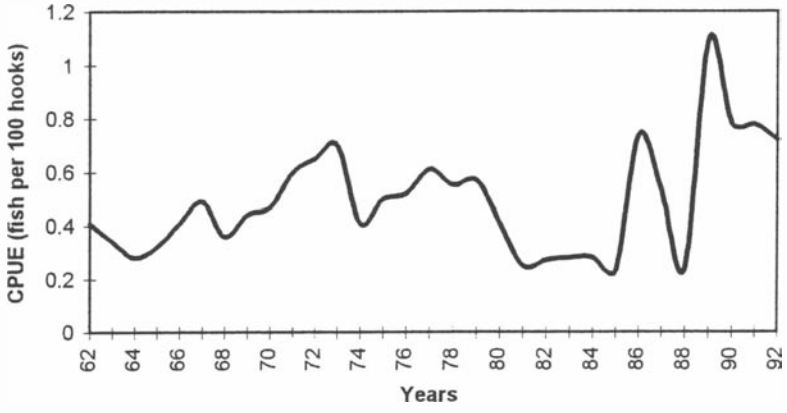
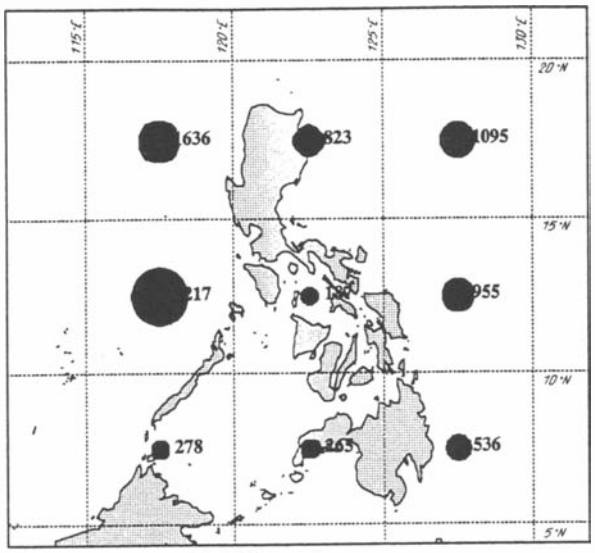
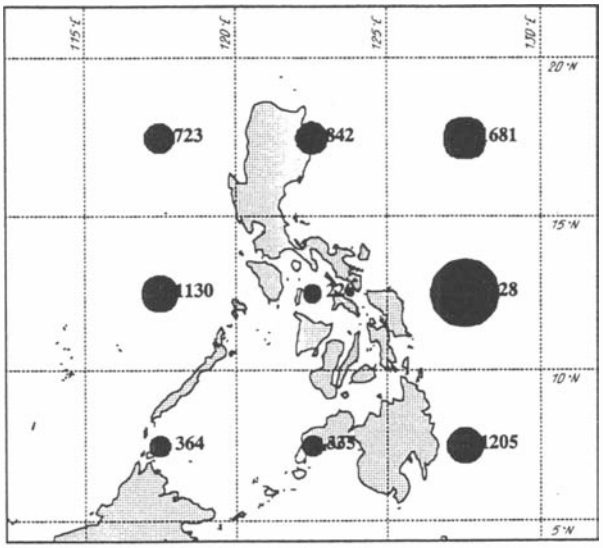


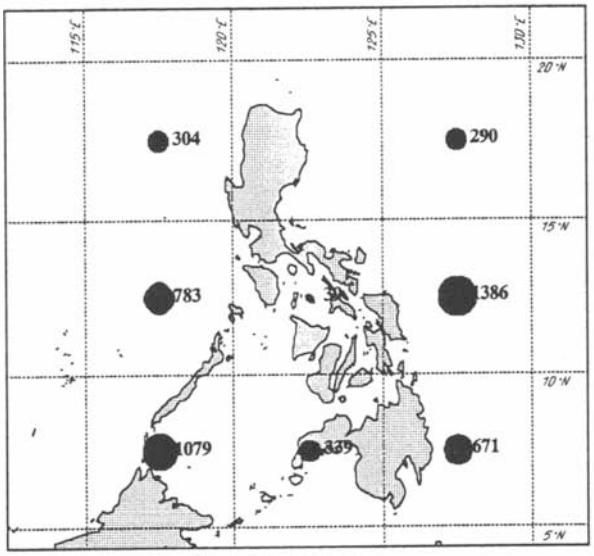
Figure 8. Distribution of average effort for Japanese longline vessels fishing in the vicinity of the Philippines 1962-1992



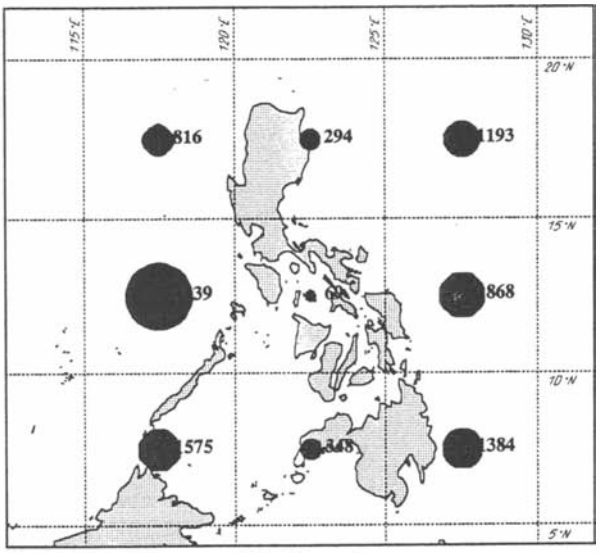
1st Quarter



2nd Quarter

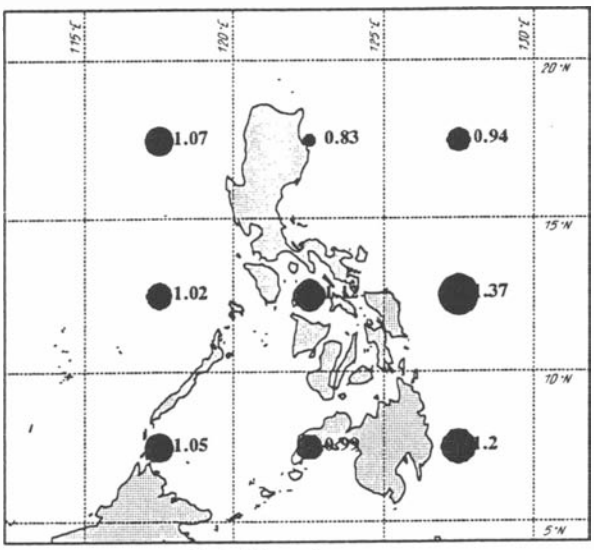


3rd Quarter

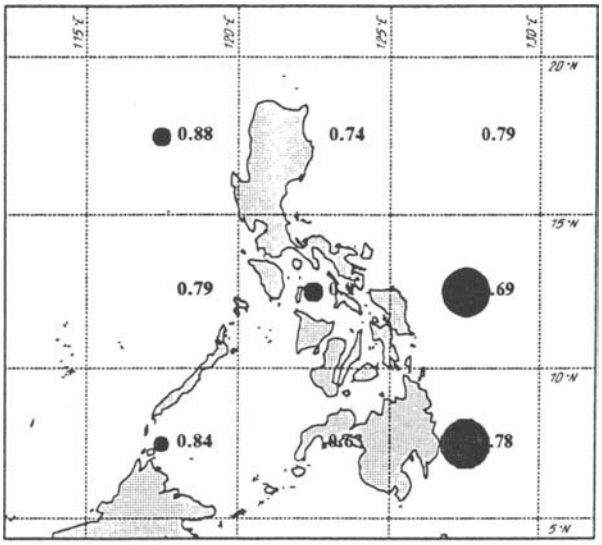


4th Quarter

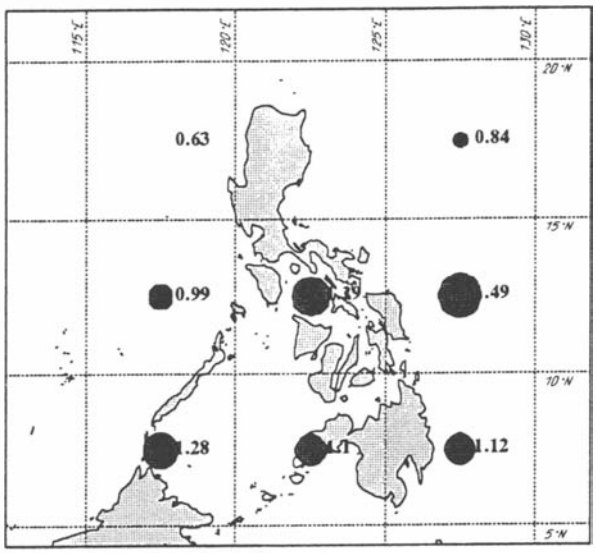
Figure 9. Distribution of Yellowfin NPUE (number of fish / hundred hooks) for Japanese longline vessels fishing in the vicinity of the Philippines - 1962->1992



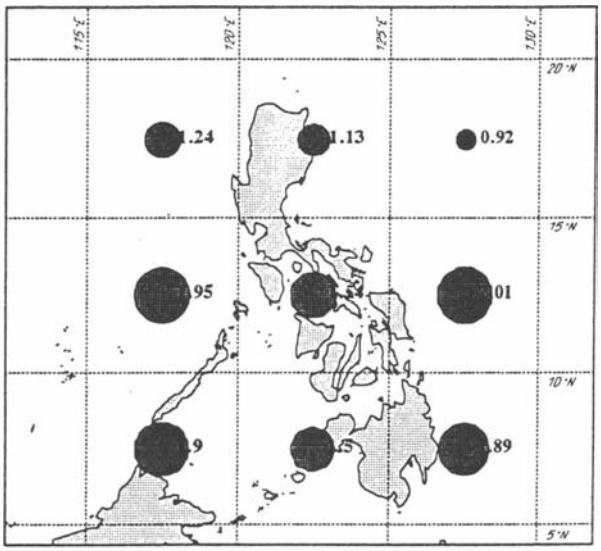
1st Quarter



2nd Quarter

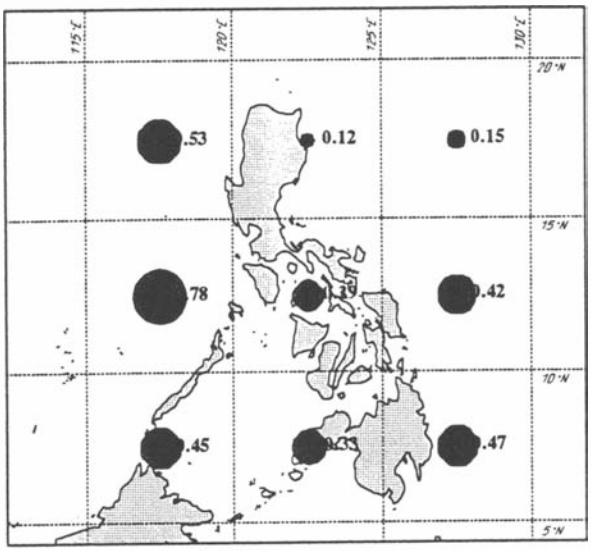


3rd Quarter

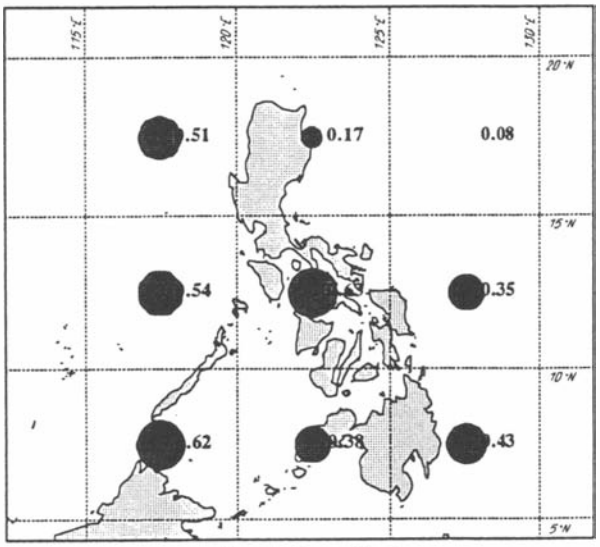


4th Quarter

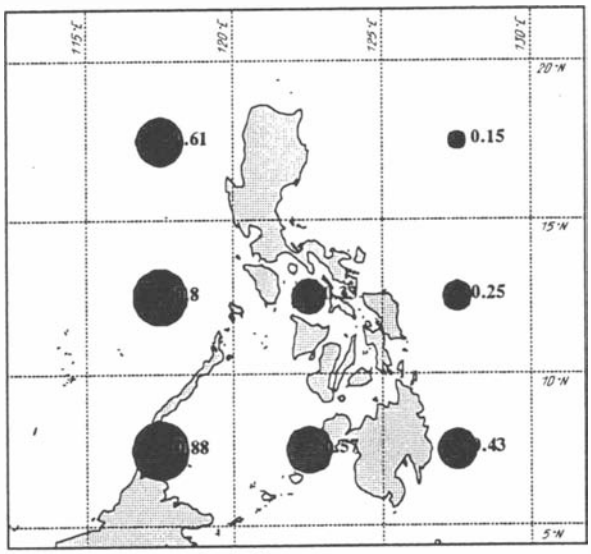
Figure 10. Distribution of Bigeye NPUE (number of fish / hundred hooks) for Japanese longline vessels fishing in the vicinity of the Philippines - 1962->1992



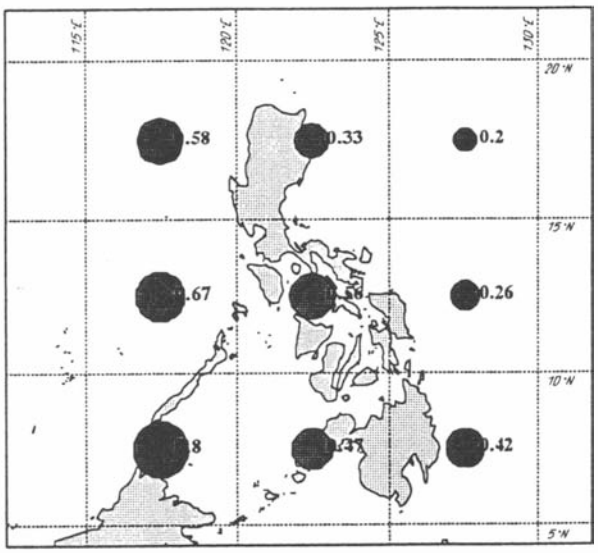
1st Quarter



2nd Quarter



3rd Quarter



4th Quarter

Figure 11 Seasonal Japanese longline effort in the Philippines study area for 1962-1992

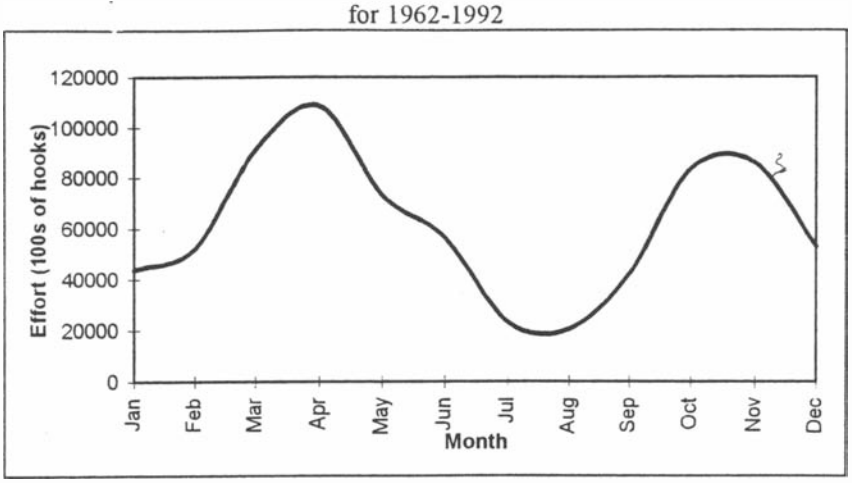


Figure 12 Seasonal Japanese longline Yellowfin CPUE in the Philippines study area for 1962-1992

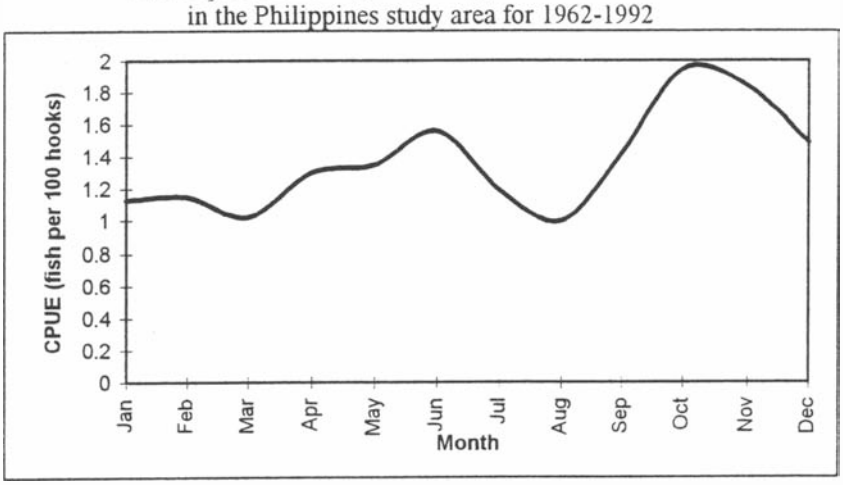
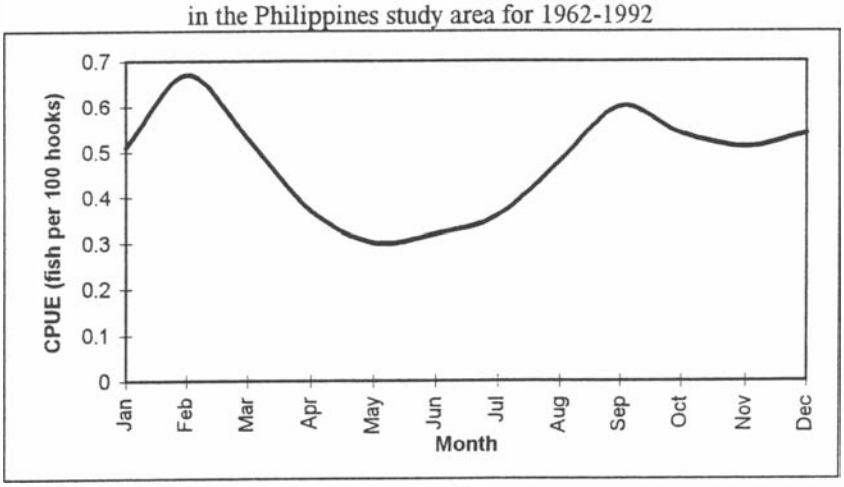


Figure 13 Seasonal Japanese longline Bigeye CPUE in the Philippines study area for 1962-1992



The broad seasonality of effort distribution and catch rates, by species, are examined in Figures 8, 9 and 10, on a quarterly basis, for all years combined. There is some evidence of a concentration in the SCS in the fourth and first quarters ie October - March, with a greater concentration of effort in the Philippines Sea during the second quarter ie April - June. Average effort levels are generally lowest in the third quarter. This pattern is consistent with the monsoonal weather situation, with effort concentrated in the SCS during the northeast monsoon period (November-May), and in the Philippine Sea during the second quarter when the southwest monsoon begins. The low effort levels in the third quarter may reflect the prevalence of cyclones at that time. Figure 6 graphs the average monthly effort in the study area, and more clearly demonstrates the above.

That this pattern is weather-related is supported by the data on catch by area by quarter, where there is little contrast in CPUE by area within each quarter, and even amongst quarters, for yellowfin, other than the tendency for higher yellowfin CPUE in the Philippine Sea. The bigeye CPUE by area by quarter is similarly relatively spatially homogenous, except for the consistently higher CPUEs in the SCS.

Seasonality in CPUE by species is examined in Figures 12 (yellowfin) and 13 (bigeye). Yellowfin CPUE appears relatively stable, with a major peak in October-November; bigeye CPUE also seems relatively stable, with some suggestion of a period of slightly elevated catch rates from September to March.

The species composition of the retained catch (an unknown quantity of the total catch, mainly by-catch species, is not retained) is relatively consistent over time, at least on an annual basis, in that the retained catch is dominated by yellowfin and bigeye (Table 1). Over the 21 year period, yellowfin comprised 62.6%, and bigeye 25.6% of the total retained catch of 42,173t. Other contributions to the total were made by albacore (2.3%), blue marlin (2.5%) and swordfish (1.9%). Minor catches of mature northern bluefin were also made, the area east of Taiwan/Bashi Channel/northern Luzon being the only known spawning area in the Pacific for this valuable species.

Between 1962 and 1980, the proportion of yellowfin in the yellowfin/bigeye catch, 88.2% of the total landed catch of all species, varied between 0.575 and 0.823, and between 0.70 and 0.79 for 12 of the 19 years. Post-1980, this percentage decreases, as noted earlier, with changes in setting practices, but so does the total catch decrease, to very low levels.

Few data are available on by-catch species, which however comprise only a small portion of the retained catch. No shark were retained, and "other species" comprise only 3.1% of the total.

5.3.2 Korean distant water longline

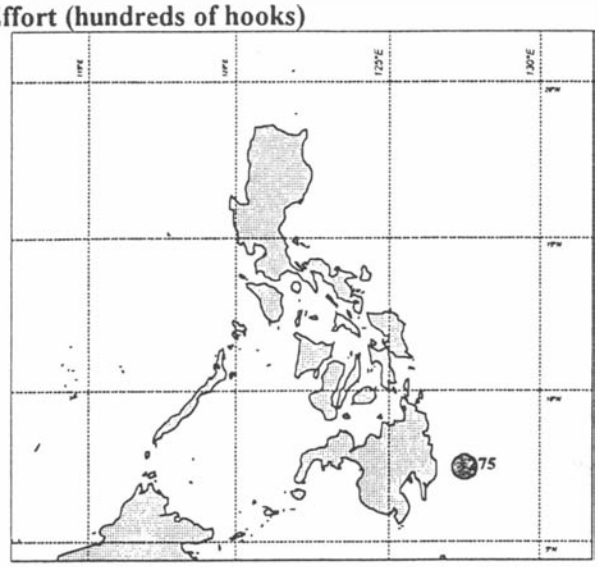
There seems to have been very little Korean longline activity in the study area, based on published book data for this fleet for the period 1975-1992 (5° by month, 1975-1987; 5° by year, 1988-1992). As Figure 14 shows, 275 days effort were recorded in 1975 in one Philippine Sea (PS) square, and 716 days in 1977 in another PS square. These limited data are unremarkable, other than for the high proportion of bigeye in the catch, particularly in 1977.

5.3.3 Taiwan distant water longline

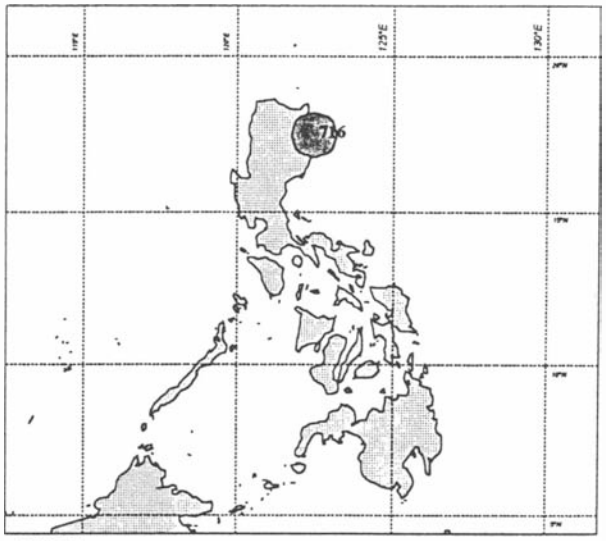
The Taiwanese distant water longline fleet operates mostly east of 130°E and south of 5°N. The study area is thus on the fringe of this operational area, and there is very little activity recorded for this fleet, based on available book data for 1967 to 1991 (5° square/month). Figure 15 shows data for the three years (1974, 1978 and 1981) where some effort is recorded; catch by species is shown in Appendix Table 2, and Appendix Figures 19 and 20.

Figure 14. Distribution of effort, bigeye and yellowfin catch for Korean distant water longline vessels fishing in the vicinity of the Philippines - 1975, 1977.

- **Effort (hundreds of hooks)**

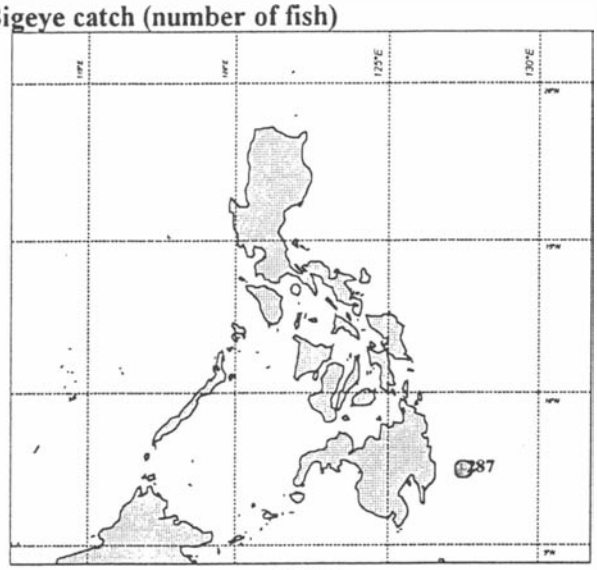


1975

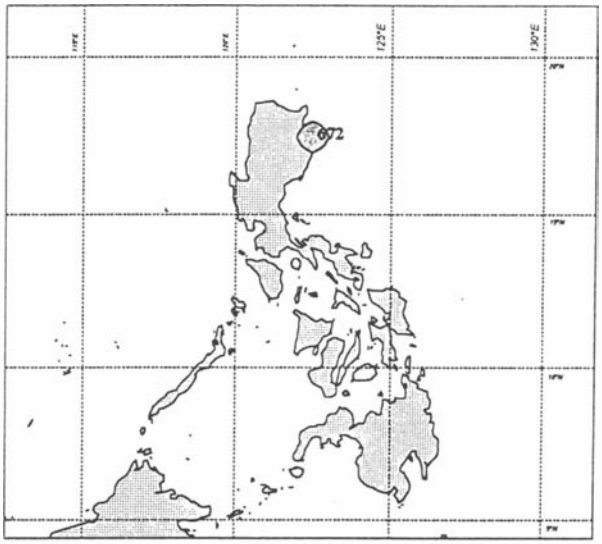


1977

- **Bigeye catch (number of fish)**

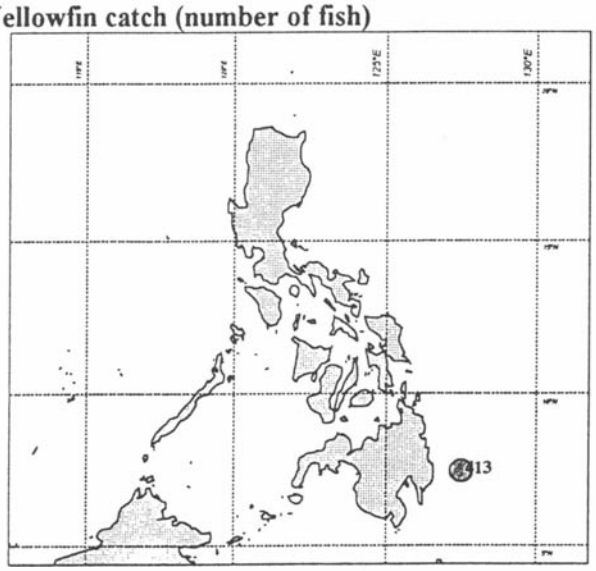


1975

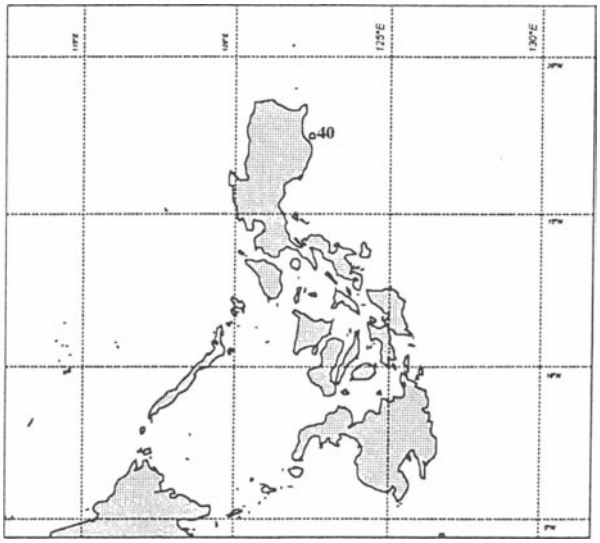


1977

- **Yellowfin catch (number of fish)**

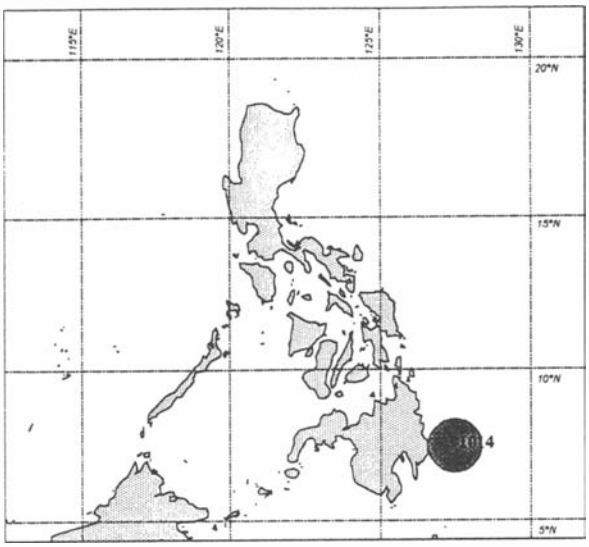


1975

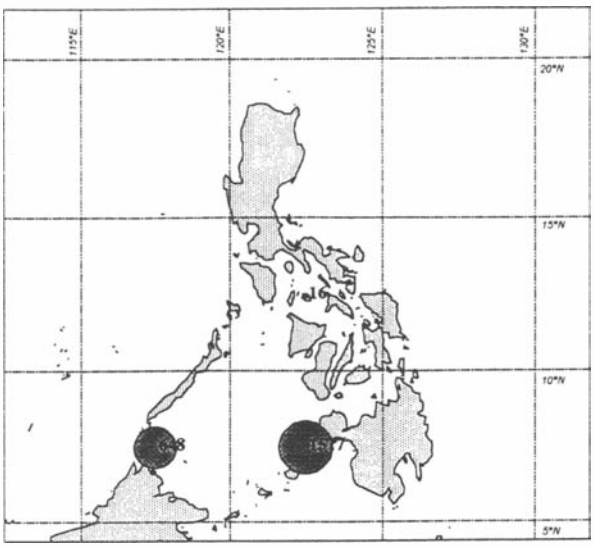


1977

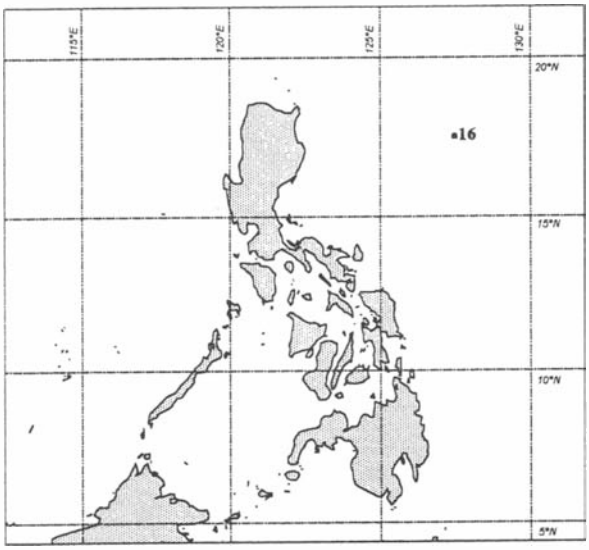
Figure 15 Distribution of effort (Hundreds of hooks) for Taiwanese distant water longline vessels fishing in the vicinity of the Philippines - 1974 - 1978 - 1981.



1974



1978



1981

5.3.4 Japan offshore longline

Japanese offshore longliners, usually defined as those less than 21 gross registered tonnage (GRT), must have originally operated in the Philippines area and the South China Sea during the 1930s, from bases in Taiwan (then a Japanese possession). However no data are available on the catches by these vessels.

Similarly, prior to 1979 when Pacific Island Nations (PINs) began to declare fishing zones in preparation for UNCLOS, no data are available on the activities of these vessels, which operate at prefectural level and are not included in national statistics. It seems certain however that offshore longliners would have recommenced operations in the study area shortly after the war. (The Japanese book data described earlier covers the activities of distant water vessels > 20 GRT from 1962 onwards). Data are available since 1979 for Japanese offshore longline vessels operating in the Palau EEZ, directly adjacent to the study area. As no such data are available for the study area, the Palau data are considered in summary form only (as confidentiality requirements pertain) to provide some indication of operational aspects of these vessels, which presumably continue to operate to an unknown extent in the study area.

The Japanese offshore longliners have, until recently, operated in almost distant water mode ie they returned the catch to ports in southern Japan and Okinawa, making return voyages of up to 1600nm in some cases, with trip lengths of three weeks or more. These vessels are highly efficient, setting up to 2,000 hooks per set, making on average 11 sets per trip, and maintaining a high catch rate of the target species, bigeye (averaging 12 fish per 1000 hooks). In recent years, increasing numbers of these vessels have transhipped some of the catch in Koror (Palau) and Guam, but most of the catch is still returned to Japan.

Although effort by these vessels in the Palau EEZ is widely distributed, there is some concentration along the western boundary, suggesting that some effort almost certainly occurs in the eastern part of the study area by Japanese offshore vessels. Yellowfin CPUE is also highest in this area. Longline effort is highest in the northern summer (May-October), when catch rates (numbers of fish per 1000 hooks) were relatively low, but bigeye and yellowfin average weights were high.

Effort in the Palau EEZ by Japanese vessels has increased steadily during the past ten years, from 3.8 million hooks per year in the early 1980s to 11.3 million hooks in 1993. At least 23 vessels were active during 1993. Catch rates of both bigeye and yellowfin have remained relatively stable since the mid-1980s, in spite of greatly increased effort by Japanese and other offshore longline vessels (see later).

In summary, it is likely that Japanese offshore vessels do operate in the eastern part of the study area, but the extent of this activity and the level of catch is unknown.

5.3.5 Taiwan offshore longline

Taiwan offshore longline vessels, by virtue of the proximity of their home ports (Tung Kang, Kaohsiung, Taitung etc), have probably accounted for the greatest amount of longline activity in the study area. These vessels have probably been operating in the Philippines area and the SCS since pre-war days. In 1940, it is reported that 300 vessels were based at Kaohsiung, and landed 12,700t of tuna and billfish. Fishing resumed soon after the war, and by 1952, this fleet is reported landing over 18,000t per year, a catch which remained relatively stable during the 1950s and 1960s, before increasing dramatically during the early 1970s, to peak at 60,000t in 1975. It has since remained over 30,000t until 1990, when the catch fell to 21,000t (Table 2 - Fisheries Yearbook, Taiwan Area 1991 (Taiwan Fishery Bureau, 1992)). In 1991, 1273 longliners in the 10-100 GRT size range were registered in Taiwan. The vessels operate essentially as ice boats, ie the catch is stored on ice, during relatively short trips, and all the catch until recently has been unloaded in Taiwan, with Tung Kang the main unloading port.

Table 2 **Annual landings by the Taiwanese offshore longline fleet, 1950-1991 (Source: Taiwan Fishery Yearbooks, 1989-1991)**

YEAR	LANDINGS (mt)	YEAR	LANDINGS (mt)
1950	13,535	1970	27,552
1951	18,709	1971	29,577
1952	18,034	1972	32,067
1953	10,605	1973	41,256
1954	12,412	1974	44,189
1955	12,914	1975	60,720
1956	14,745	1976	57,183
1957	15,653	1977	49,811
1958	16,362	1978	43,010
1959	12,719	1979	42,222
1960	14,061	1980	39,047
1961	15,589	1981	32,116
1962	16,510	1982	34,093
1963	15,760	1983	34,153
1964	15,944	1984	32,437
1964	16,276	1985	26,502
1965	18,977	1986	20,239
1967	19,451	1987	34,110
1968	24,471	1988	35,523
1969	25,850	1989	30,151
		1990	21,292
		1991	23,960

Table 3: **Annual landings by main species, Taiwan offshore longline fleet, 1989 and 1991 (Source: Taiwan Fishery Yearbooks, 1989 and 1991)**

Species Group	Landings (mt) 1991	Landings (mt) 1989
Dolphin Fish	5,428	2,070
Skipjack	640	603
Auxis spp.	44	-
Mackerel Tuna	13	424
Sp. Mackerel (wahoo)	52	134
Albacore	341	504
Bigeye	1,129	374
Yellowfin	5,838	11,933
Bluefin	237	202
Young Tuna	2,006	2,717
Swordfish	366	1,398
Striped Marlin	254	184
Blue Marlin	2,152	2,644
Black Marlin	651	306
Sailfish	585	477
Shark	2,191	4,340
Others	1,527	1,620
TOTAL	23,960	30,151

It is not certain how much of this catch is normally taken within the study area, but the only detailed study of the activity of these vessels during 1981-82 (Sun and Yang, 1983) suggests that at that time, if the data are truly representative, as much as 60% of the total effort was expended in the study area. With the 1981 and 1982 landings listed as 32,100t and 34,000t respectively, the catch at that time in the study area may have been 19,000 - 20,000t. In the peak year (1975), this could have been as high as 36,000t assuming the same spatial distribution of effort.

Sun and Yang's study shows definite seasonal shifts in the distribution of effort (Figure 16). During May-July, effort is concentrated in the north-east of the study area, in the Philippine Sea east of Luzon, shifting south-east off Mindanao during August-December, when some effort is displaced into the SCS. During January-March, all effort is directed at the SCS, with some movement back into the Philippine Sea beginning in March. These shifts in effort are entirely consistent with the prevailing monsoon pattern, ie north-east monsoon November - May, south-west monsoon June - October, and consistent with the seasonal distribution of effort previously noted for Japanese distant water vessels.

The species composition of the catch as given by Sun and Yang indicate that yellowfin completely dominated the catch at that time, making up between 65-81% of the catch by weight. Other significant contributions by numbers and weight include bigeye (8-25%), swordfish, shark and dolphinfish. This species composition is consistent with the gear used (conventional tarred rope), and the generally shallow setting depths. An earlier breakdown of the catch (19,000t) for 1966 (Kume, 1973) gave the catch composition by number as 47,000 tunas, 20,000 billfish and 40,000 sharks.

The 1991 landings data for the same fishery (Table 3) indicate a somewhat different picture, with tunas making up only 43% of the catch by weight, followed by dolphinfish (23%), billfish (17%, half of this blue marlin) and shark (9%). Landings data for 1989 were also obtained, and are more consistent with the earlier Sun and Yang data; at that time, tunas made up 56% of landings, billfish 17% (half blue marlin), shark 14% and dolphinfish only 7%.

The Taiwan offshore fishery has thus remained essentially a yellowfin fishery even to the present. Much more of the by-catch is landed than is the case in most longline fisheries, especially distant water longline fisheries (see earlier), but also the Japanese offshore longline fishery operating in the same area. If the described decline in the proportion of target tuna species, especially yellowfin, in the landed catch between 1989 and 1991 is real, this may well have influenced the recent major change in operational strategy of much of this fleet. Sun and Yang also provide information on size composition of the yellowfin catch (most fish between 110-150cm, or 23-57 kg), sex ratio of the yellowfin catch (32% female overall), spawning seasonality (peaks in 2nd and 3rd quarters), and detail on the incidental catch of mature northern bluefin tuna in waters east of Luzon, the Bashi Channel and Taiwan.

Since 1987, an increasing proportion of the Taiwan offshore fleet has relocated to bases in the western Pacific, where it has been possible to air-freight chilled fish to the Japan market, either direct or via Guam, and obtain higher prices for the quality fish. Initially, vesels were based in Koror, Palau, from 1987 onwards, but operations were soon established throughout Micronesia - Yap, Chuuk, Pohnpei and Kosrae - and the Marshall Islands (Majuro). Further expansion of these operations is planned eg to Solomon Islands. Numbers of vessels in Palau probably peaked at about 150 vessels in 1990, but the total of Taiwanese offshore longline vessels operating from foreign bases in the region may have approached 300 in 1993. This is a significant proportion of the total number of registered longliners in the 10-100 GRT size range, which was 1273 in 1991.

Of the relocated vessels, the Palau-based vessels, smaller than 90 GRT, averaging 49GRT, but with many in the 20-50GRT range, are of most interest to this study, since it can be assumed that some of their catch was made in the study area. Most make two week trips, setting approx 1000 hooks per set, and making efforts to target bigeye with deeper sets. Bigeye comprise 39% of the landed catch by number.

Figure 16

Distribution of fishing effort, in number of hooks, of the Inshore Tuna Longline Fishery, July 1981-June 1982. The number in parentheses indicates the number of cruises observed. Number of hooks ($\times 10^3$):

∘ -0.9; • 1.0-3.5; ○ 3.6-6.5; ● 6.6-9.5; ⬤ 9.6-

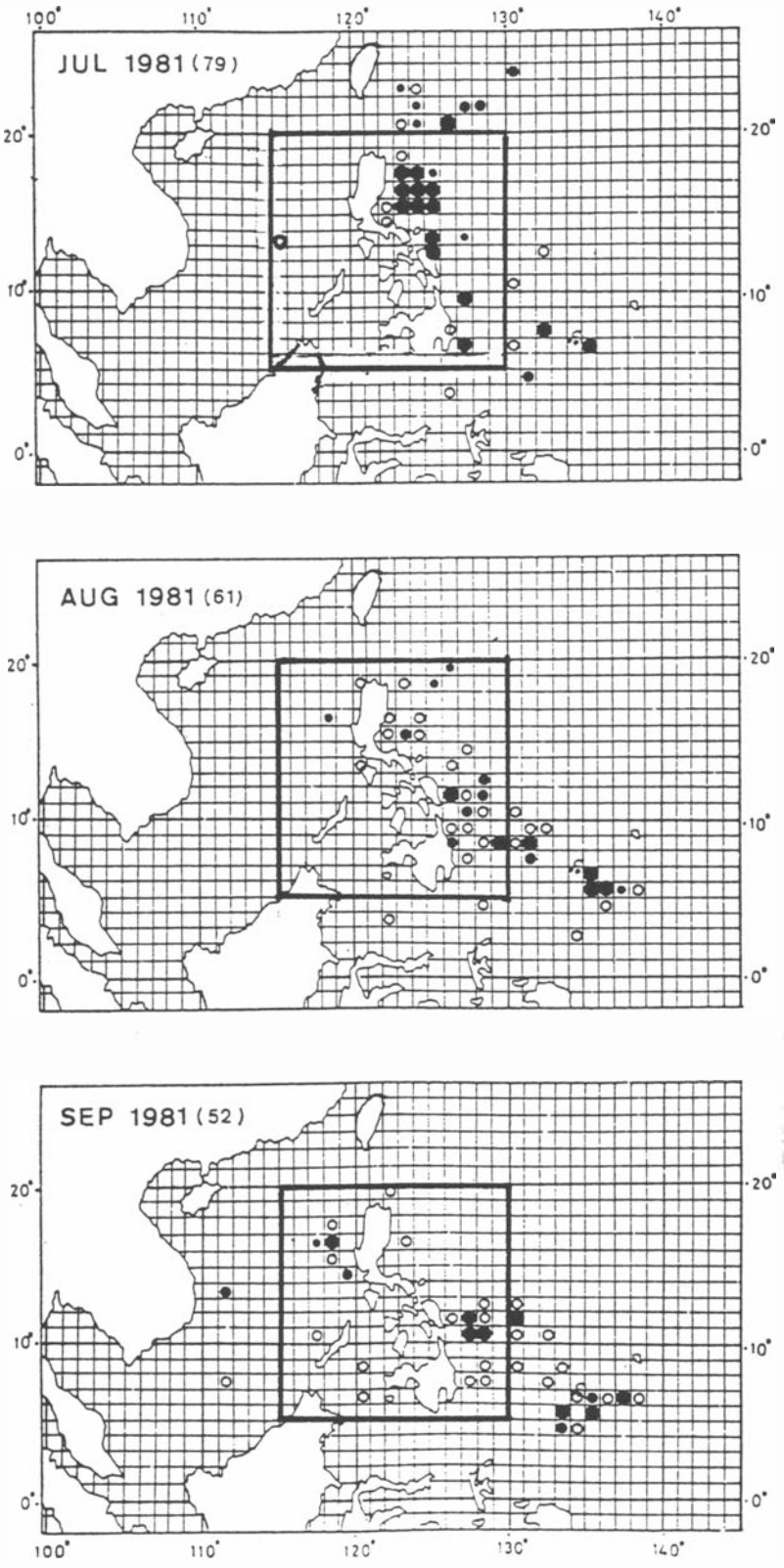


Figure 16 - continued.

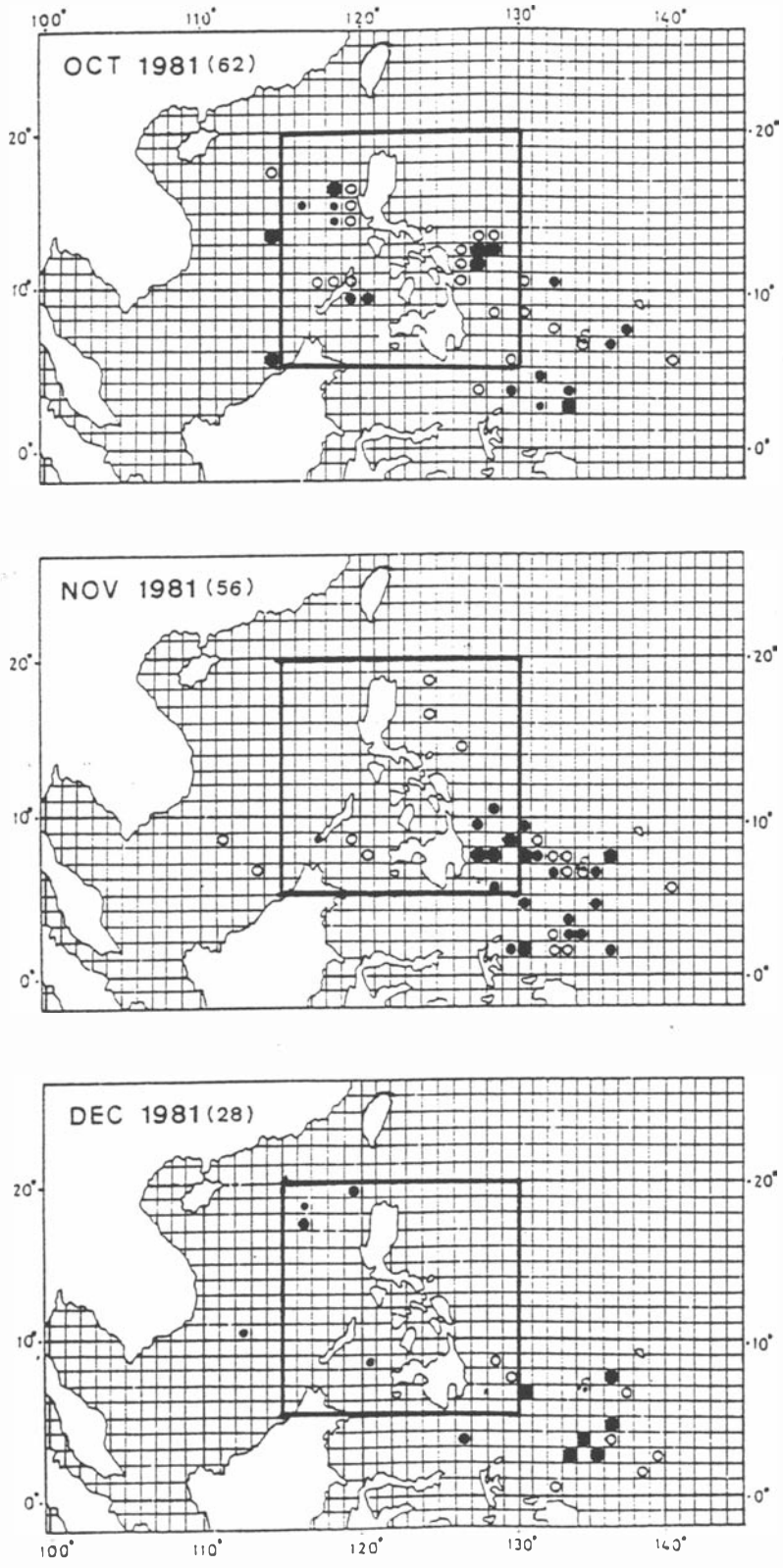


Figure 16 - continued.

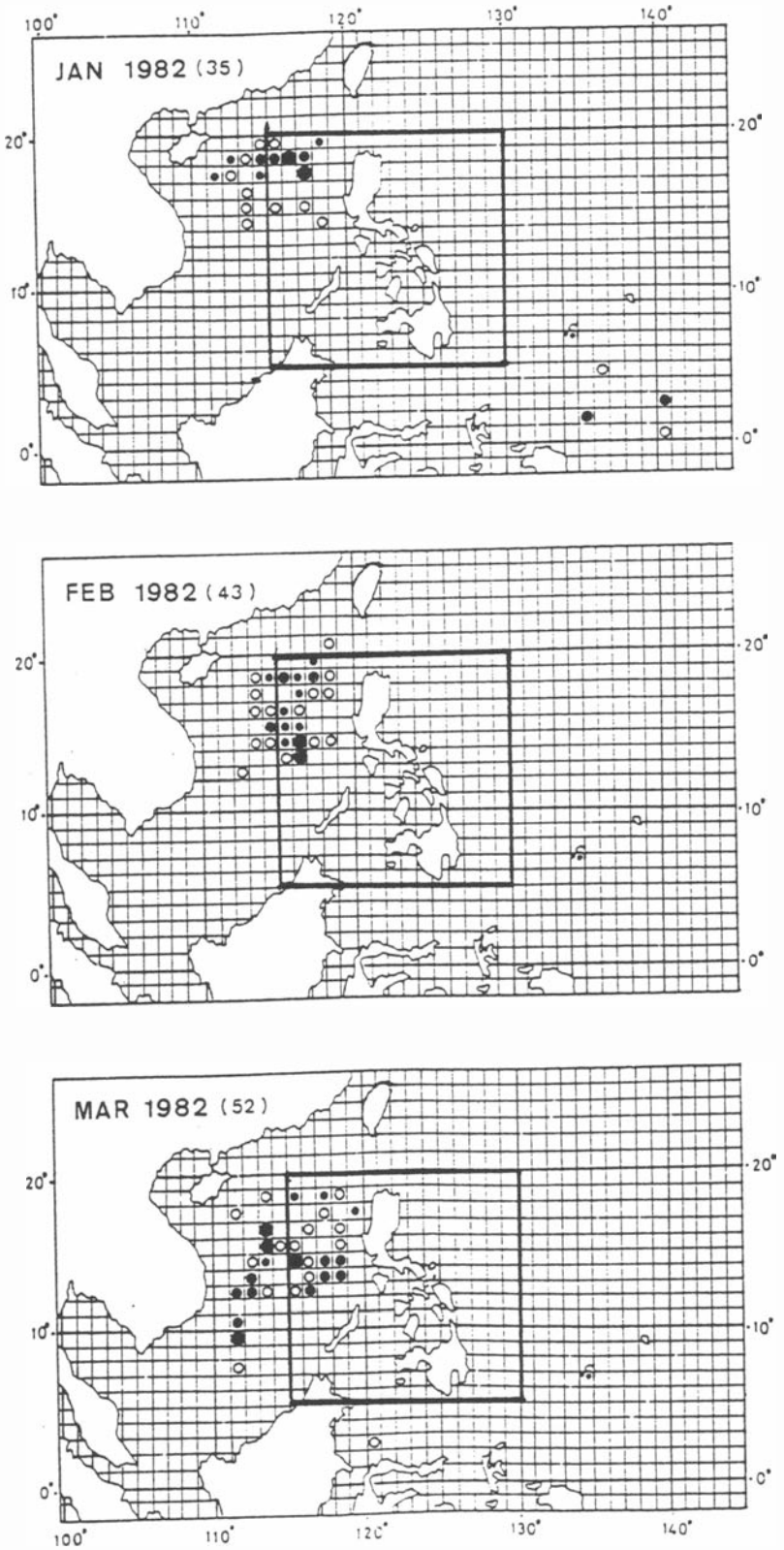
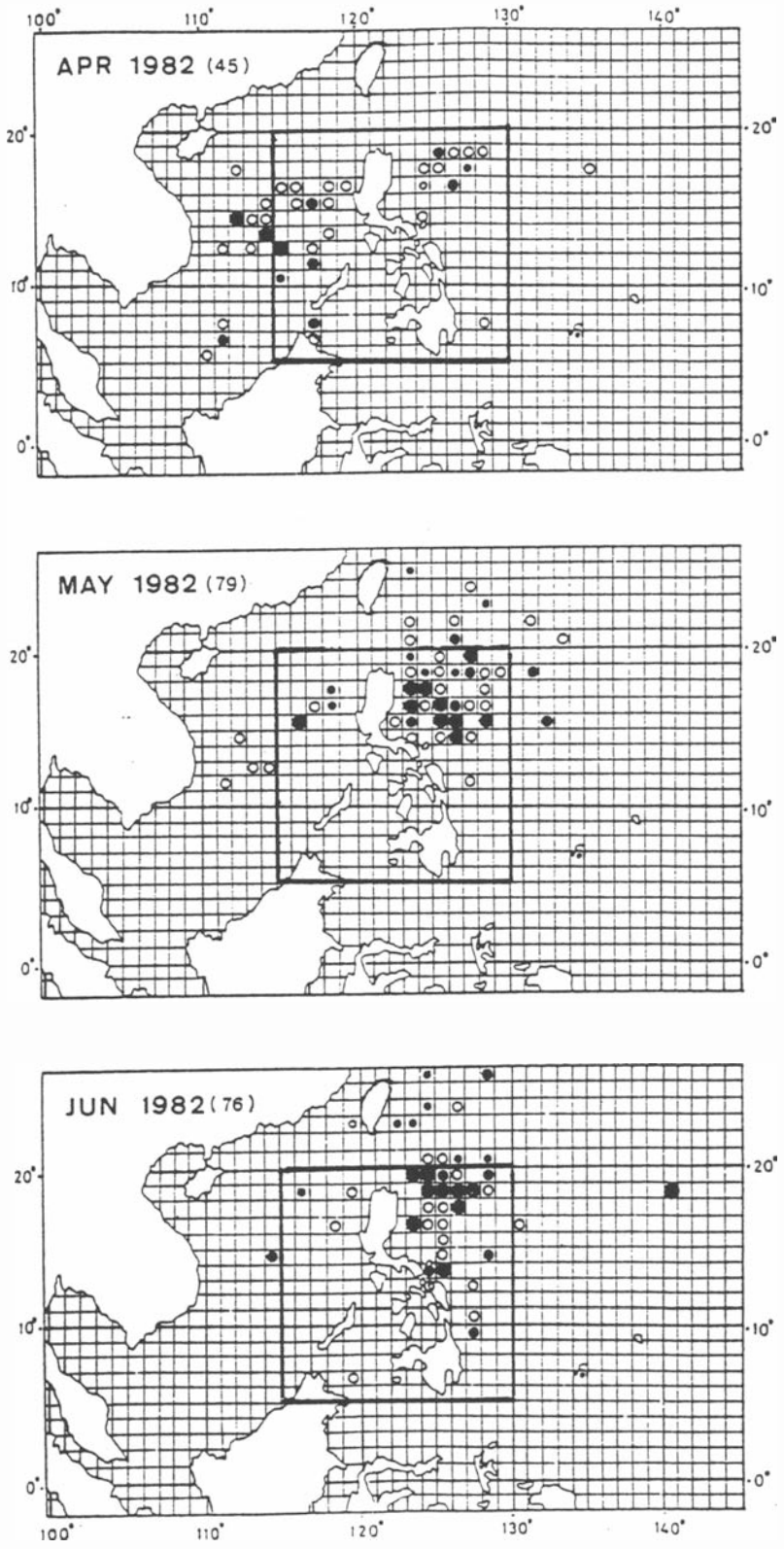


Figure 16 - continued.



5.3.6 Chinese offshore longline

It is believed that Chinese longliners began operating in the western Pacific in 1988, under charter to Taiwanese companies, and operating initially out of Koror (Palau), and later from Micronesian ports. It is not clear if these vessels had previously fished as tuna longliners, but as most were apparently from northern ports/provinces and had a trawler configuration, this is probably unlikely. Thus, unlike the Taiwan offshore fleet, these vessels constitute new entrants into the fishery rather relocations. The Chinese vessels based in Palau were of a wide size range, with an average GRT of 61t, setting relatively few hooks (650 average), making short trips, and having lower catch rates than Taiwanese or Japanese offshore longliners. Effort has been highest in the June-October period. Some of the catch by these vessels has certainly been made in the study area, but data on the volume of catch are not available. Although over 200 Chinese vessels fished out of Palau for all or part of both 1992 and 1993, and total landings (all fleets) exceeded 3,000t in both years, the catch in the study area is unlikely to have been more than several hundred tonnes by Chinese vessels.

5.3.7 Other longline

It is possible in the past that Vietnam and Cambodia have harvested some tuna, possibly by longline, on the SCS side of the study area. No data are however available on such catches.

6. STATUS OF TUNA STOCKS IN THE STUDY AREA

6.1 Scientific assessments

Stock assessments based on the analysis of tagging data have been prepared both on a regional basis (RTTP) and for the Philippines, the latter being the principal output of the primary phase of the present project (PTRP). The PTRP work, utilizing over 3,500 tag returns from the 13,700 tag releases (26%) confirmed the very high current exploitation rates of small skipjack, yellowfin and bigeye in Philippine waters, in fact the highest yet recorded in a tropical tuna fishery. Despite this, growth overfishing seems not to be occurring, due to the high rates of natural mortality, although there may be some risk of recruitment overfishing, depending on the extent to which local stocks are self-sustaining. In the case of adult yellowfin and bigeye, of more interest to the longline fishery, no estimates of exploitation rates are available, but the apparent scarcity of medium-sized fish in Philippines waters suggests that there is likely to be little linkage between the heavily exploited local juvenile and adult spawning populations. Tag returns from large yellowfin recaptured in the Philippines, but released 1-3 years earlier in a wide variety of locations throughout the WTP would support this.

Results of the regional assessments indicate that current levels of exploitation of yellowfin (and skipjack) are modest, and that some possibility exists to further increase catches on a sustainable basis. Local depletion in areas of heavy exploitation may still however be a possibility.

Much less is known of the status of bigeye stocks, and nothing at all is known of stocks of billfish and by-catch species.

6.2 Fishery indicators

Longline CPUEs for yellowfin in the study area (Japanese distant water longliners) have been declining since the early 1980s, consistent with a similar region-wide decline. It is not possible to determine whether this is due to decreased abundance, or is a result of increased targeting of bigeye. In any case, there has been relatively little activity by these vessels in the study area since 1980. It is not believed that this declining CPUE has any negative implications for the Philippine longline fishery. Of more concern may be the apparent decline in catch rates in the handline fishery, but no data are available to consider this.

The bigeye CPUE, on the other hand, is increasing or shows no trend, both regionally and in the study area.

There is no time series of CPUE data available for the key longline fishery in the present context, the Taiwanese offshore fishery. As noted, total landings have been declining somewhat in recent years (but are at levels previously observed in 1985-86); this decline may however be independent of catch rates, ie simply due to effort reduction. Of more interest is the relocation since 1987 of an increasing proportion of the total fleet (possibly 25%) to operational bases in the western Pacific, mostly in Micronesia. It is not clear if this is a response to better catch rates in these areas, or declining catch rates in the traditional fishing areas, including the study area. If it is the latter, this could be taken as indirect evidence of local depletion, with negative implications for Philippines-based longline development.

7. DISCUSSION

Although the study has been hampered to some extent by the lack of some key data to enable previous fishing activity in the Philippines EEZ and surrounding areas to be assessed, eg time series of detailed data on the Taiwanese offshore longline fleet, it is possible to draw some conclusions relative to the prospects for tuna fishery development in the study area.

The potential for surface fishery development - purse seine and pole-and-line - in the Philippine Sea seems limited. Sightings of surface schools of tuna in this area seem low relative to the western Pacific, and the available catch data show that little if any DWFN activity occurs in waters just to the east of the Philippines. Typically strong currents and great depths relatively close to shore would restrict purse seine activity / payao deployment other than in areas close inshore.

The potential for surface fishery development in the South China Sea is likely to be greater - some seasonal activity by Philippine vessels has occured there for some years - but is unlikely to be realised or assessed, at least in the vicinity of the Spratly Islands, until territorial claims have been resolved.

Longline activity has been occurring in the study area by Japanese/Taiwanese offshore vessels for almost sixty years - hardly surprising given that the northern tip of Luzon is only 240 nm from Kaohsiung and nominal territorial limits in the Bashi Channel only 60 nm. The potential is clearly proven, with annual catches in the study area possibly approaching 40,000t in peak years from all fleets. During this time, little Philippine domestic longline activity has occurred (although a handline fishery exploiting esentially the same species/stock developed rapidly during the 1980s, with peak landings exceeding 30,000t); at least two companies are currently operating small-medium sized longline vessels, although no details are available on catches, area and scale of operations, etc. Such details would obviously be useful in evaluating prospects for domestic longline fishery development, and would complement this study.

Relatively few data are available on the longline fishery, except for the activities of the larger Japanese distant water longline vessels from 1962-1992. These vessels reported taking 42,137t during this 30 year period, although activity since 1980 has been at a low level. This coincides with a shift to targeting bigeye, and provides indirect evidence that bigeye catch rates (or perhaps fish sashimi quality) in the study area may be lower and less attractive than elsewhere in the western Pacific.

Much larger catches can be assumed to have been taken by Taiwanese offshore, and to a lesser extent, Japanese offshore longliners. Since 1987, PRC longliners based in Palau have probably also taken a proportion of their catch in the study area. The Taiwanese fleet alone may have taken up to 36,000t in the peak year (1975). Unfortunately, there are few data available on these fleets for the study area, although it has been possible to make some inferences from landings data, data from nearby Palau provided under access arrangements, and one study done on the Taiwanese offshore fleet in the early 1980s.

The fishery for these offshore vessels has essentially been a yellowfin fishery (65-81% of the landed catch by weight), with smaller quantities of bigeye and a range of by-catch species. There are marked seasonal shifts in the area fished, which are closely related to monsoonal weather patterns. This was also seen for the Japanese distant water fleet, and it seems that availability of tuna species may not show much seasonal change. There appears some evidence of higher yellowfin catch rates in the Philippine Sea than the SCS, and vice versa for bigeye.

The fleet of Taiwanese offshore longline vessels is currently reported to be approximately 1300 vessels. Since 1987, one quarter of these vessels have relocated operations for all or part of the year to bases in the adjacent WTP. Total landings in Taiwan have also decreased since that time (it is however not known if these include overseas landings), and there is some qualitative evidence that the proportion of tuna target species in the catch has declined between 1989 and 1991. These events in combination could be taken as evidence of local depletion, but in the absence of more detailed time series of CPUE and other data, is difficult to substantiate. Increased targeting on, and the greater value of, bigeye also needs to be taken into account, and it has already been noted that the Japanese distant water longline fleet relocated in the early 1980s once bigeye were targeted by deeper setting gear.

It is therefore likely that the fishery will appropriately continue to target yellowfin, with one proviso. There appear to have been no attempts to deploy the monfilament longline gear now in wide use by small-medium vessels in the western Pacific and elsewhere. Stored on a reel drum and used in conjunction with a line shooter, this more compact gear enables deeper setting gear to be more easily deployed (and hence targetting bigeye) and a large number of hooks to be set from relatively small vessels. Trials with this gear type may allow the important question of bigeye availability to deep setting gear in the study area to be addressed. Other developments in the region to maximize bigeye catch include setting shallow during the full moon period. It is not clear if such operational modifications have been tried in the study area; reports by observers may be able to confirm such detail.

In summary, the potential for longline fishery development in the study area has long since been proven, during its fifty plus years' history. The main questions relate to the economic viability of domestic longline operations, possibly in the face of declining catch rates. Given possible negative interaction with existing handline fisheries in southern areas (Mindanao), establishment of such operations should perhaps not be encouraged in that area unless operating in longer range mode. Trials with monofilament longline gear should be encouraged, as noted, as the proportion of bigeye in the catch may be crucial to economic viability and this approach may lessen interaction with handline gear. Some attempt should be made to obtain data from existing domestic longline operations in Philippine waters. Operations based in northern Luzon will be well placed to seasonally shift operations with monsoonal change, and should be well placed to provide high quality (short trip) fish for export air freight markets, provided suitable logistical arrangements can be put in place. Philippine companies already have an established record in consigning fresh tuna by airfreight to Japan. There would seem to be disadvantages in marketing the catch in Taiwan. It is assumed that there will be ready domestic markets for virtually all the by-catch, which should all be landed.

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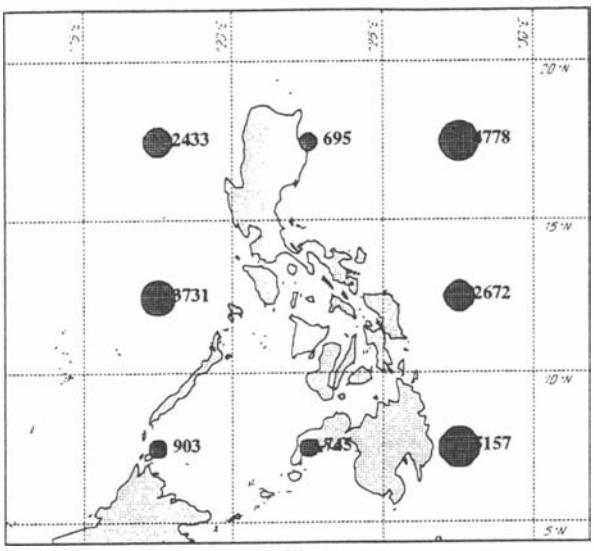
APPENDICES

Figure 1. Distribution of effort for Japanese longline vessels fishing in the vicinity of the Philippines, 1962-1967



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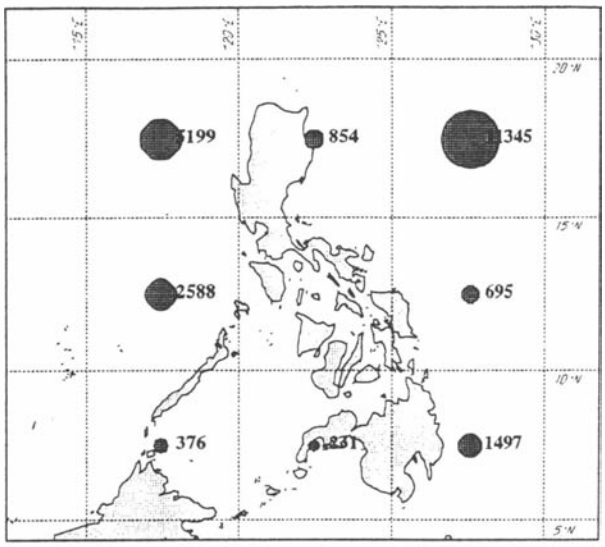

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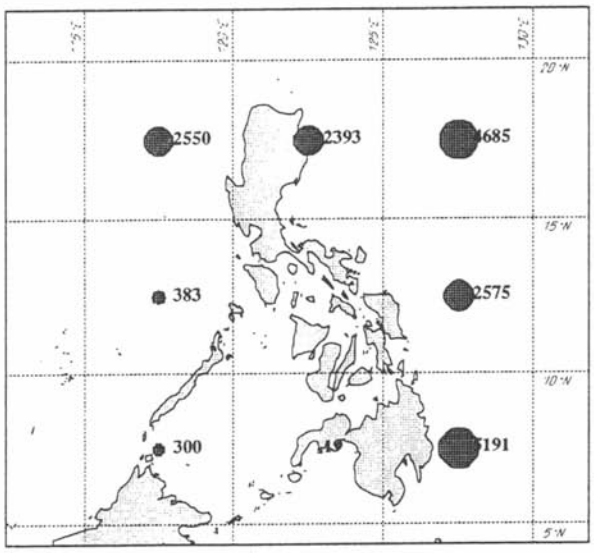

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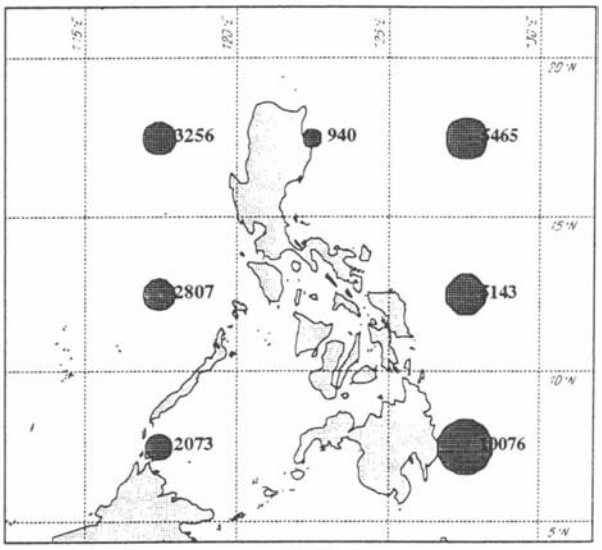

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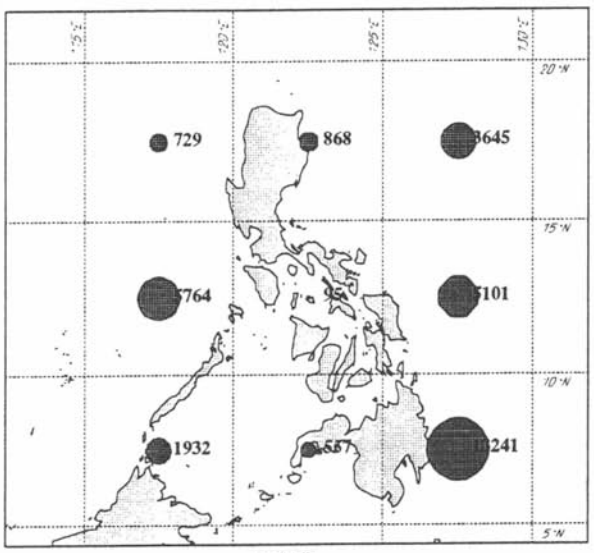

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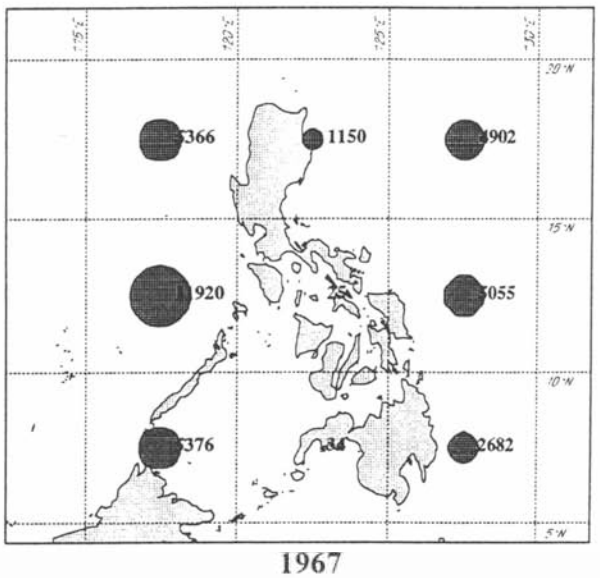

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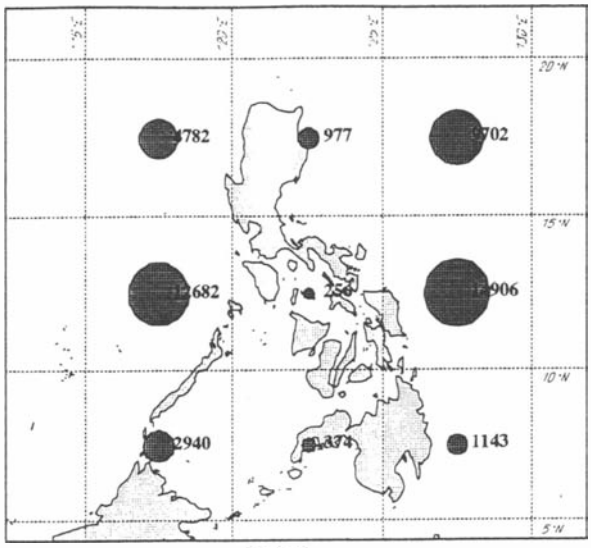
Figure 2 Distribution of effort for Japanese longline vessels fishing in the vicinity of the Philippines, 1968-1973



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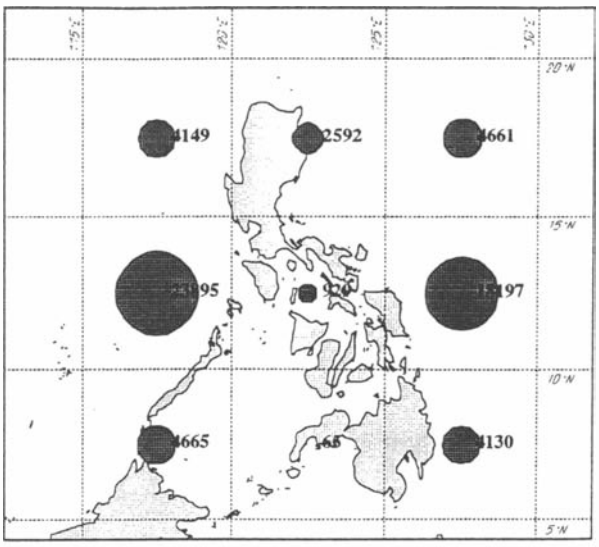

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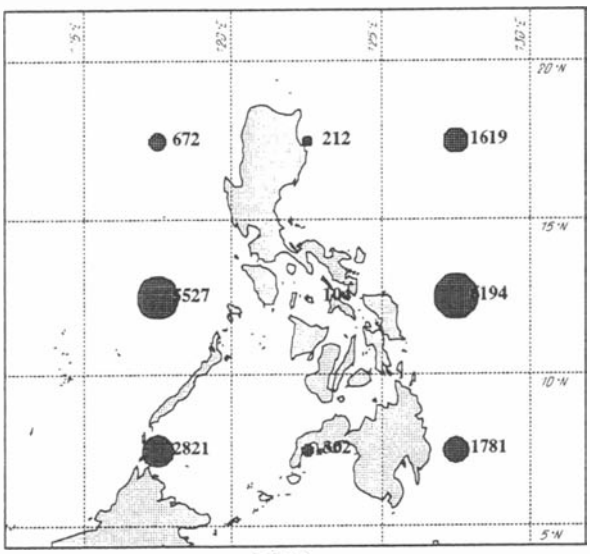

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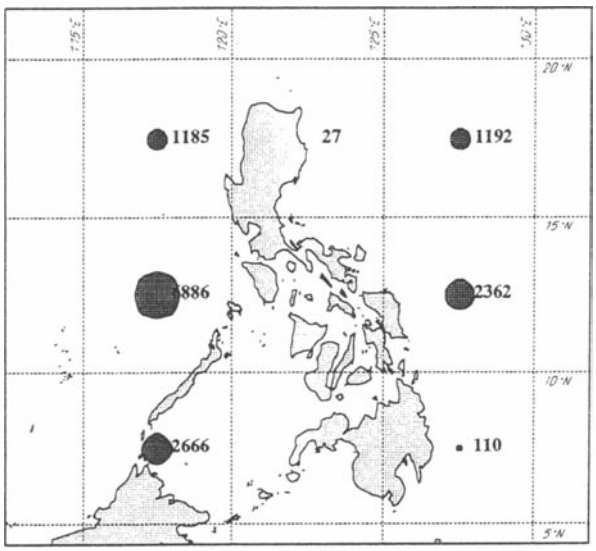

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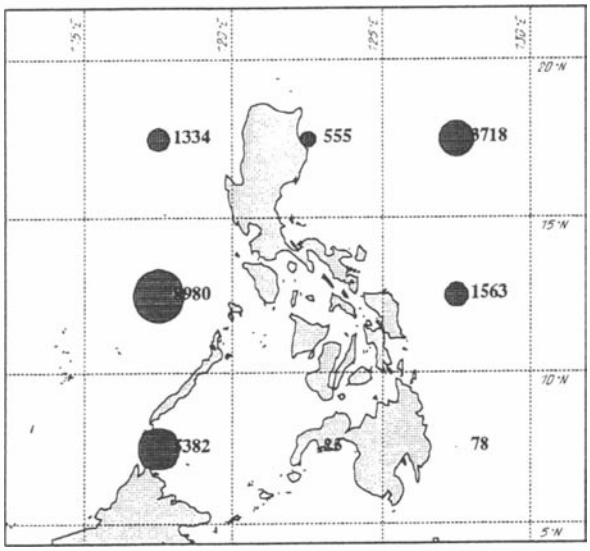

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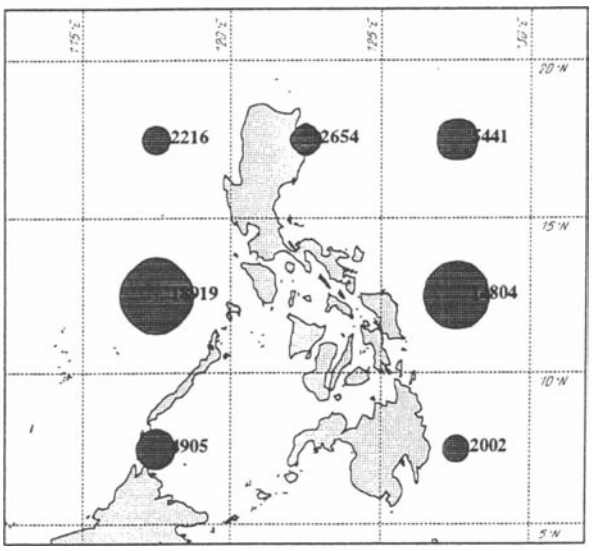

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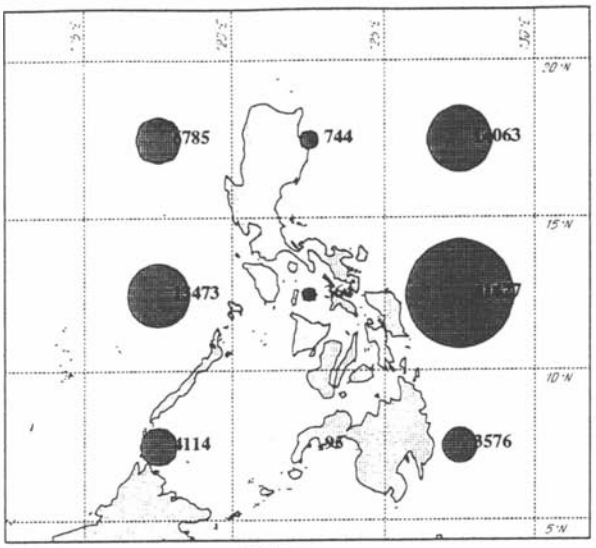
Figure 3. Distribution of effort for Japanese longline vessels fishing in the vicinity of the Philippines, 1974-1979



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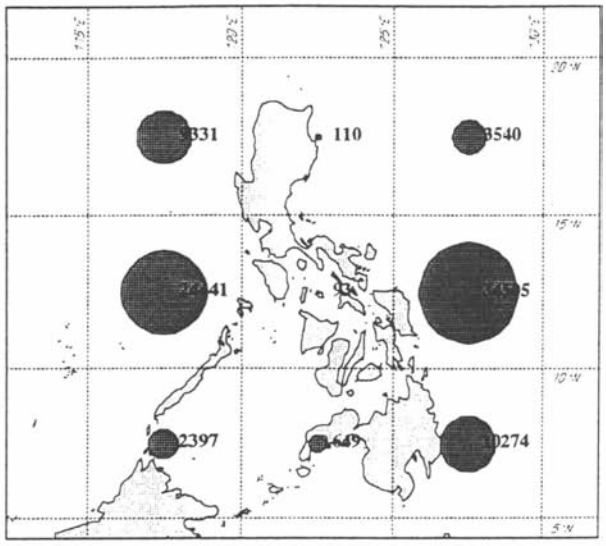

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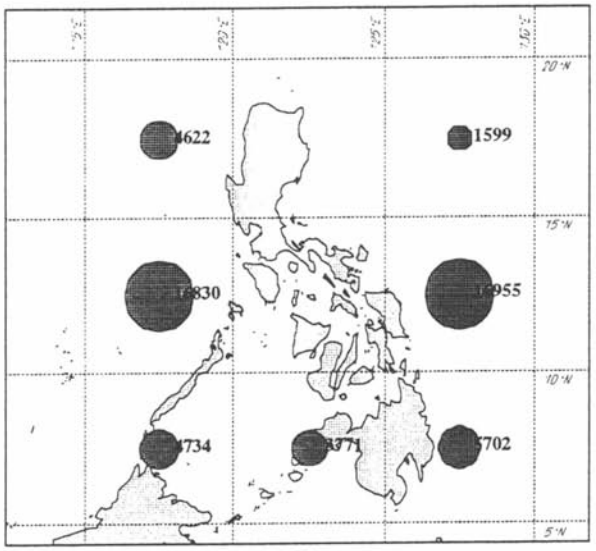

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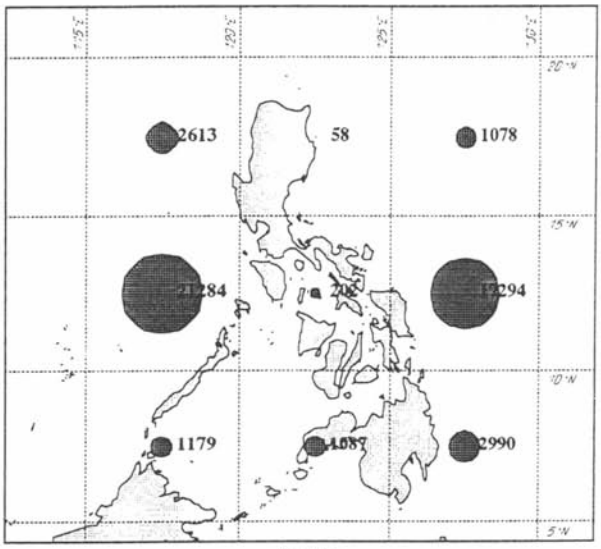

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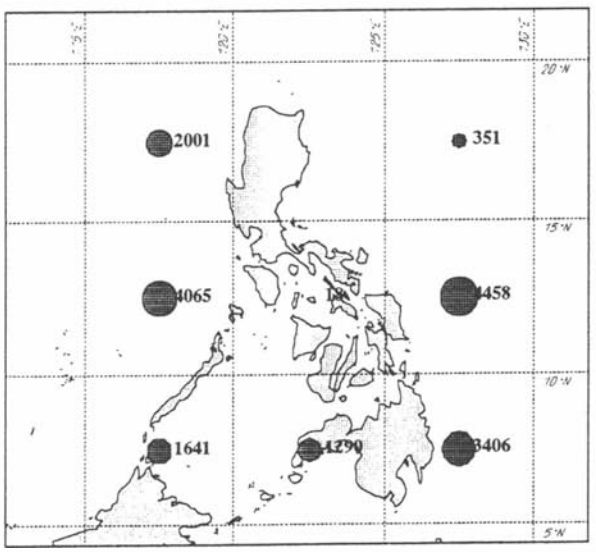

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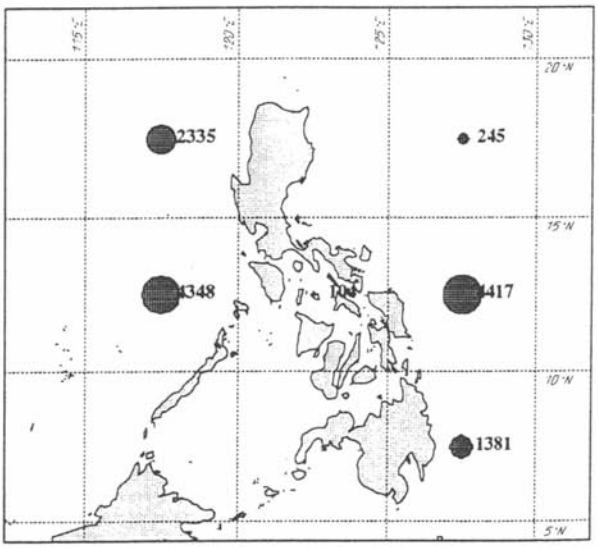

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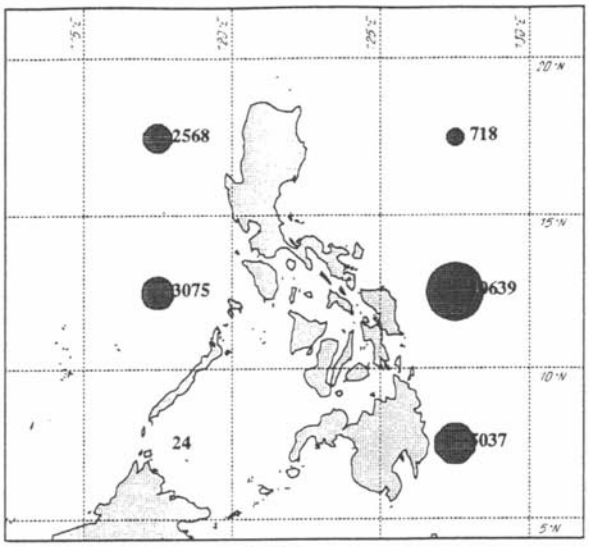
Figure 4 Distribution of effort for Japanese longline vessels fishing in the vicinity of the Philippines, 1980-1985



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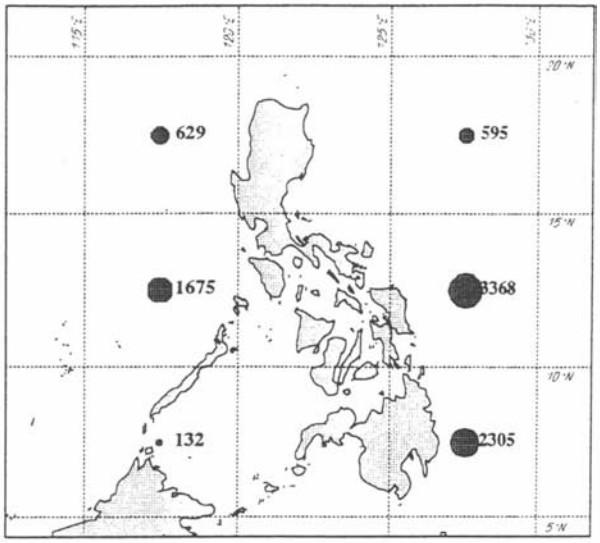

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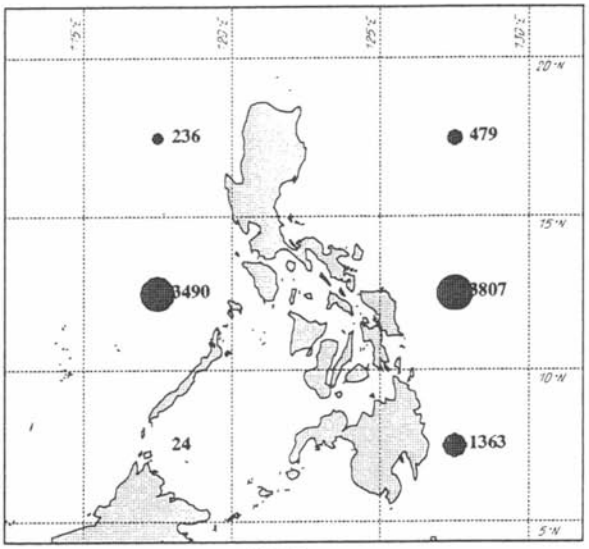

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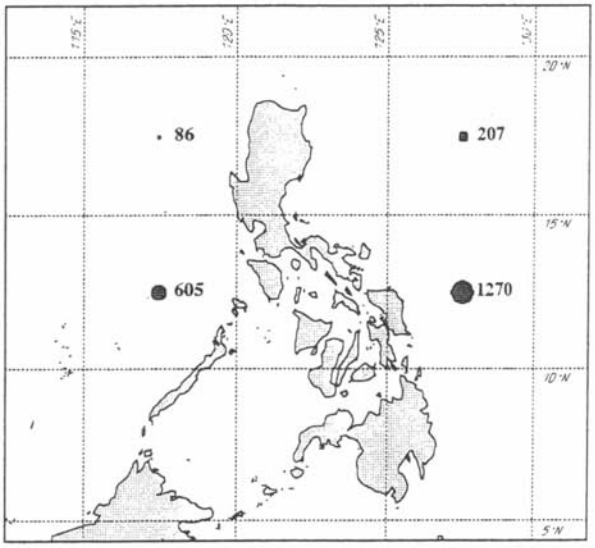

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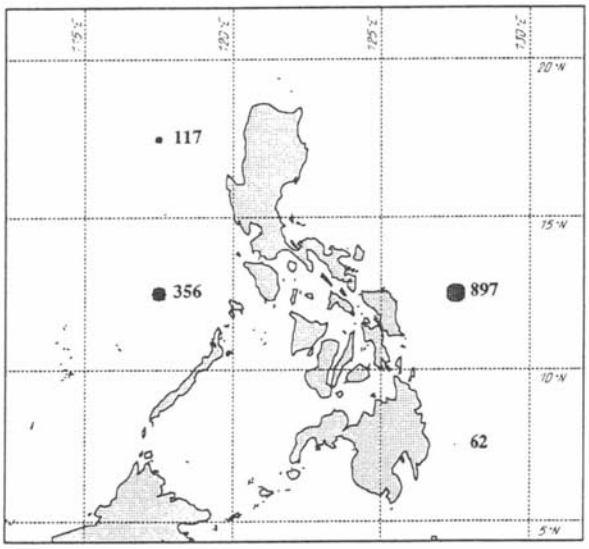

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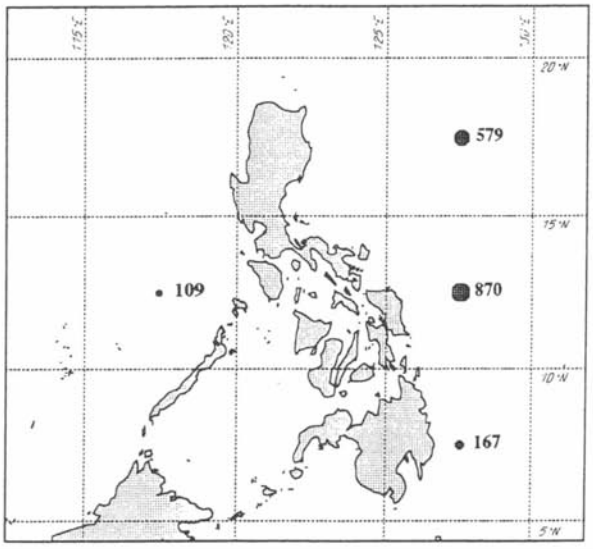

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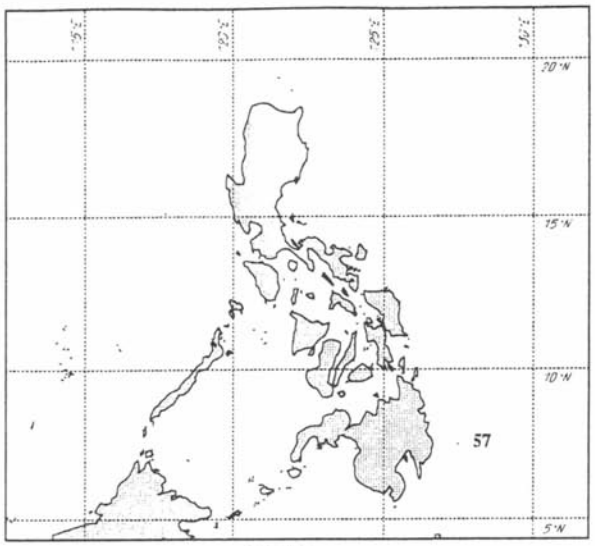
Figure 5 Distribution of effort for Japanese longline vessels fishing in the vicinity of the Philippines, 1986-1991



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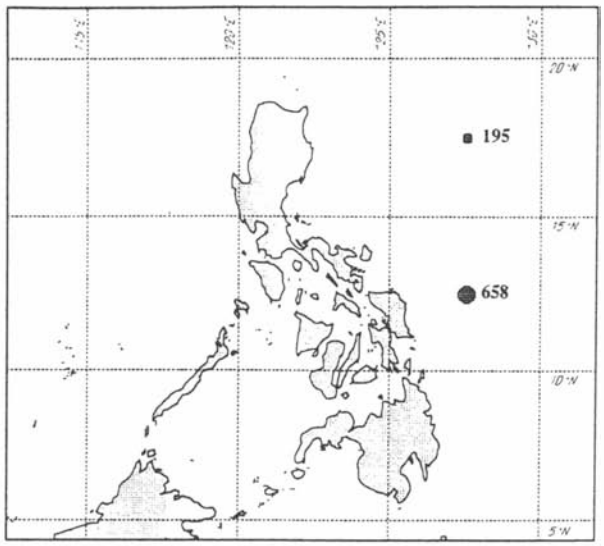

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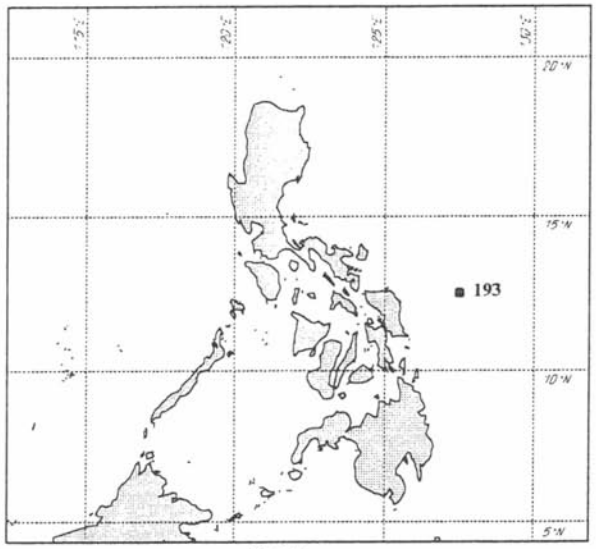

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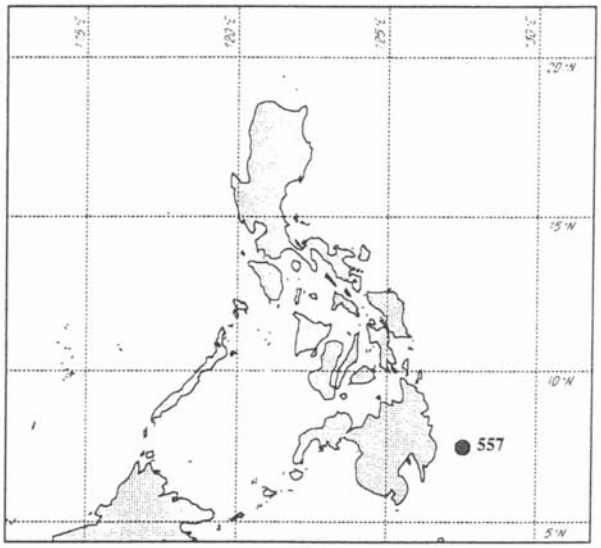

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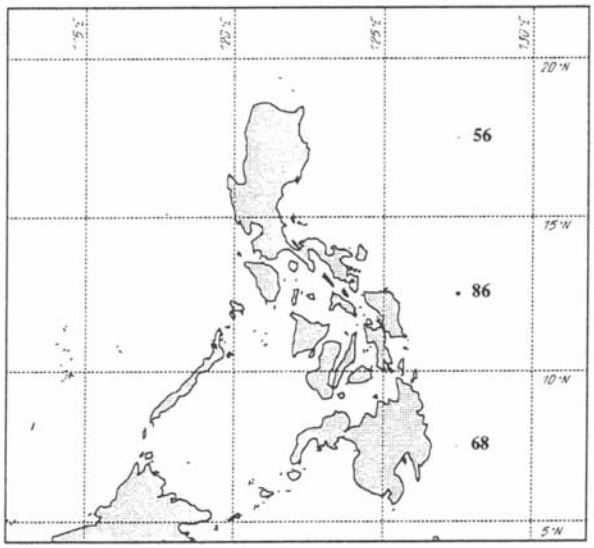

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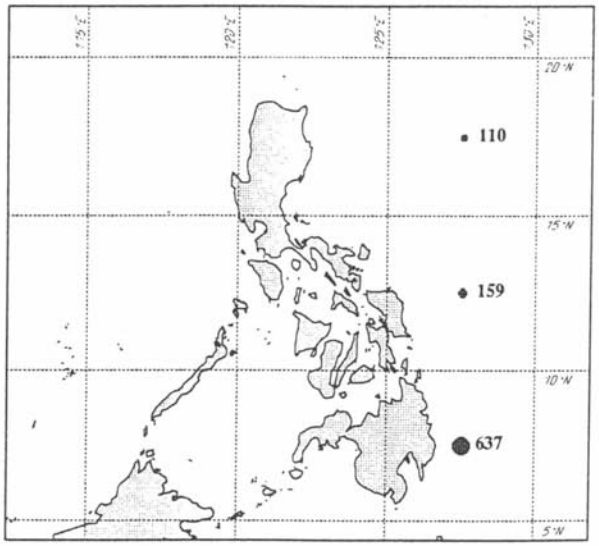

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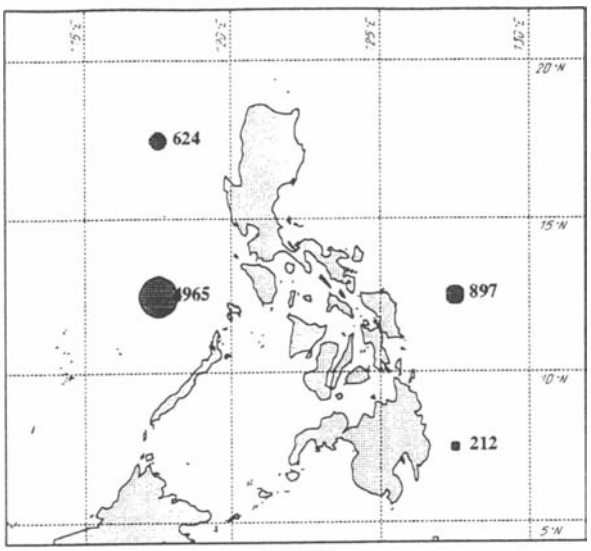

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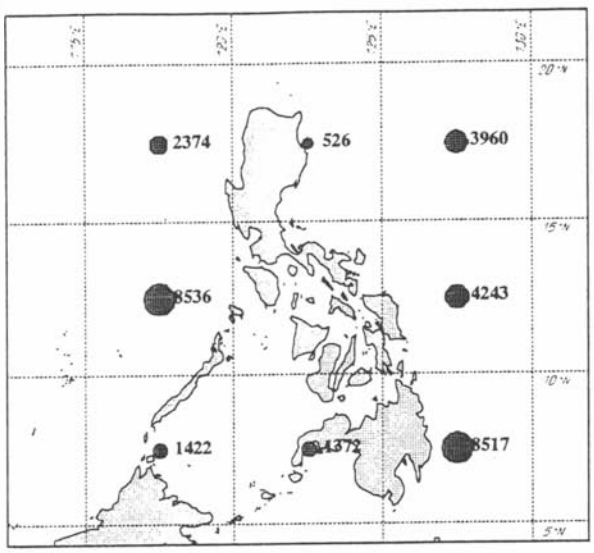
Figure 7 Distribution of Yellowfin catch (Number of fish) for Japanese longline vessels fishing in the vicinity of the Philippines, 1962-1967



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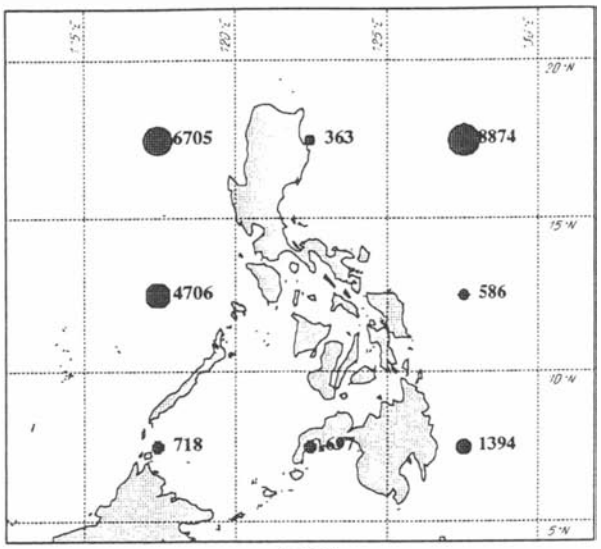

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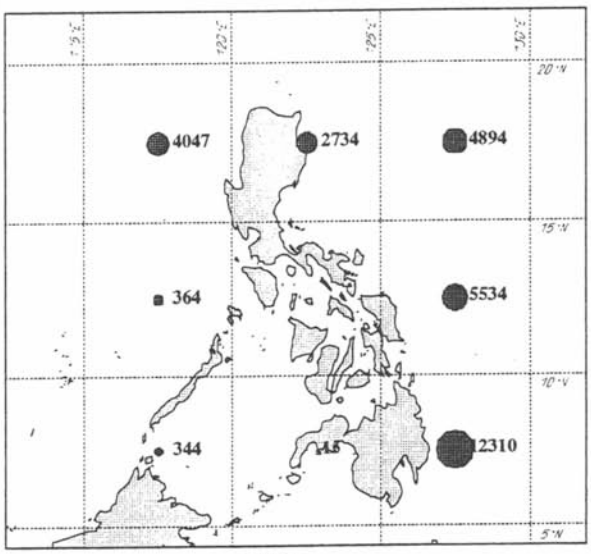

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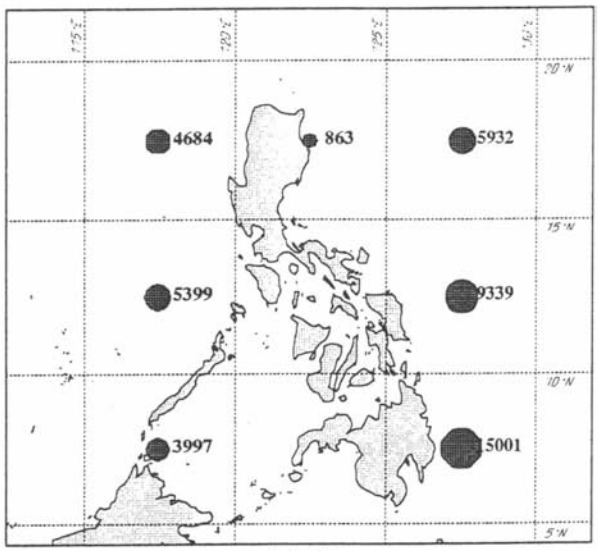

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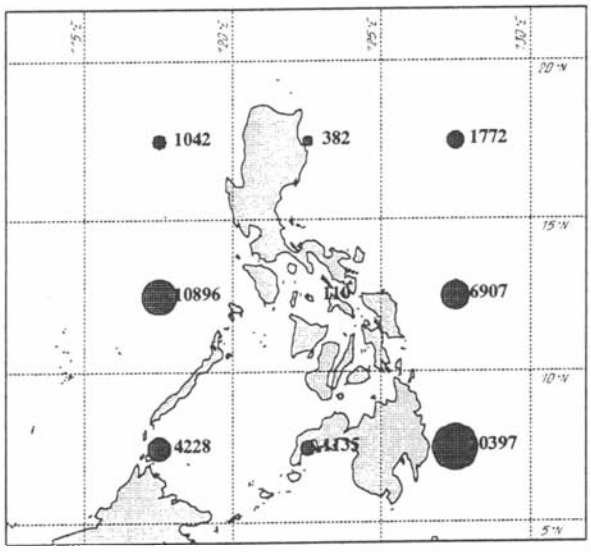

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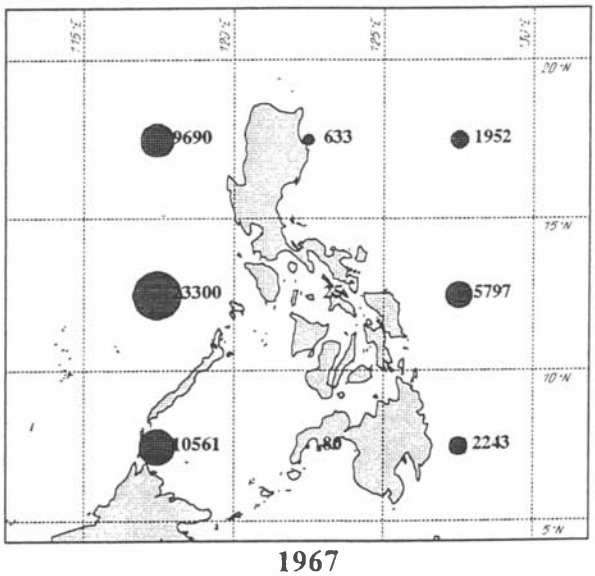

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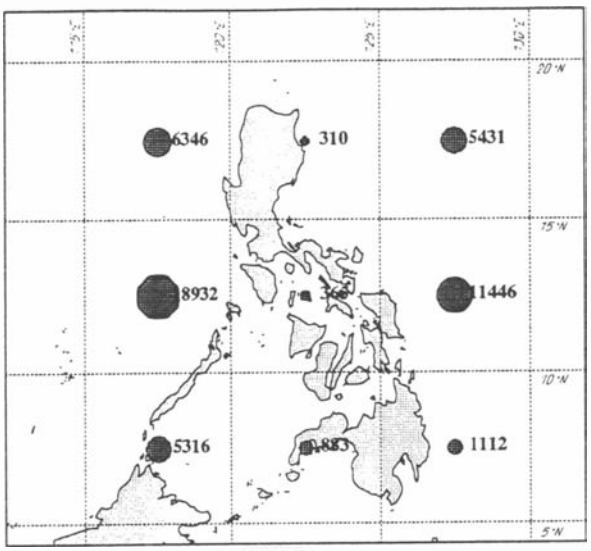
Figure 8 Distribution of Yellowfin catch (Number of fish) for Japanese longline vessels fishing in the vicinity of the Philippines, 1968-1973



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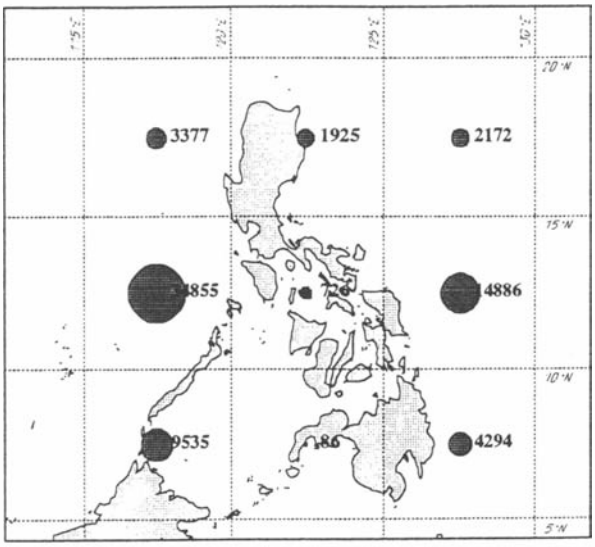

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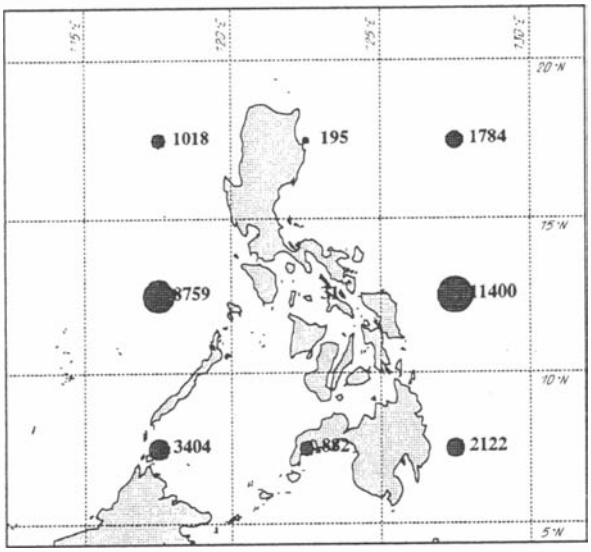

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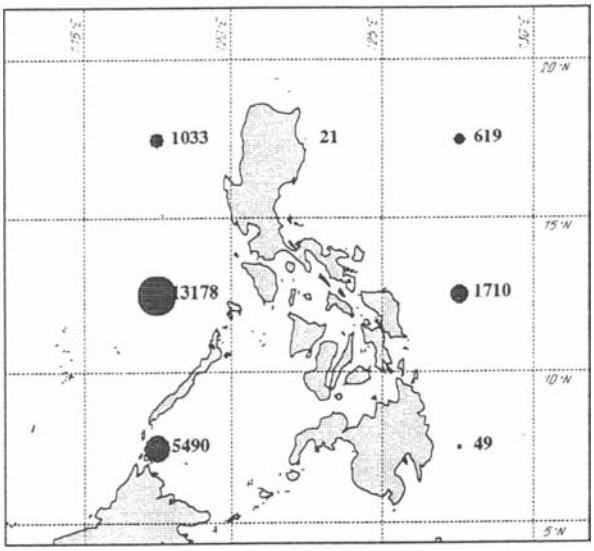

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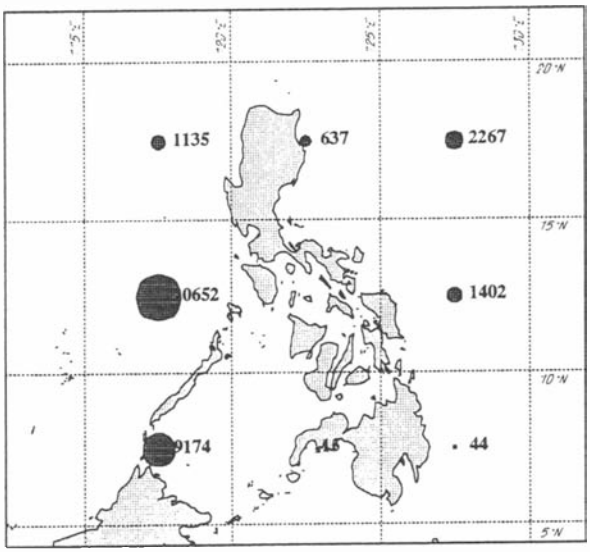

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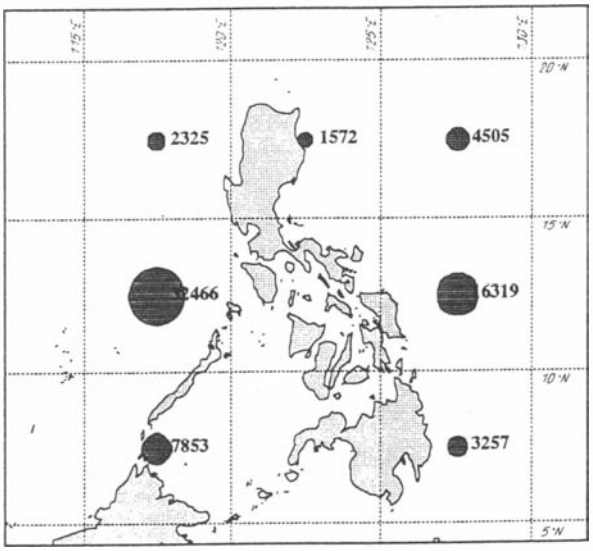

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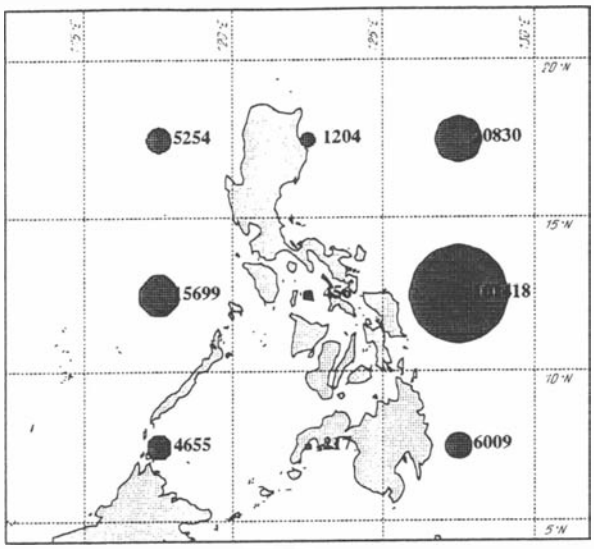
Figure 9 Distribution of Yellowfin catch (Number of fish) for Japanese longline vessels fishing in the vicinity of the Philippines, 1974-1979



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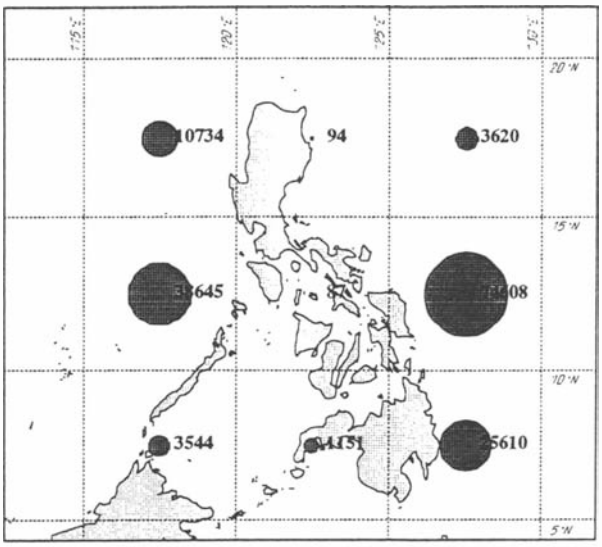

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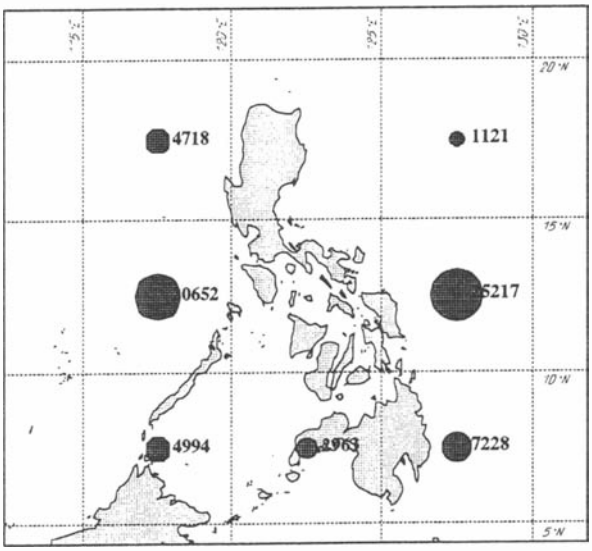

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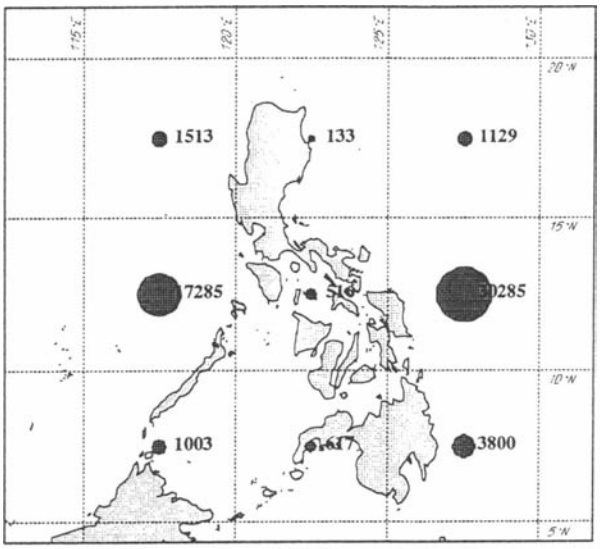
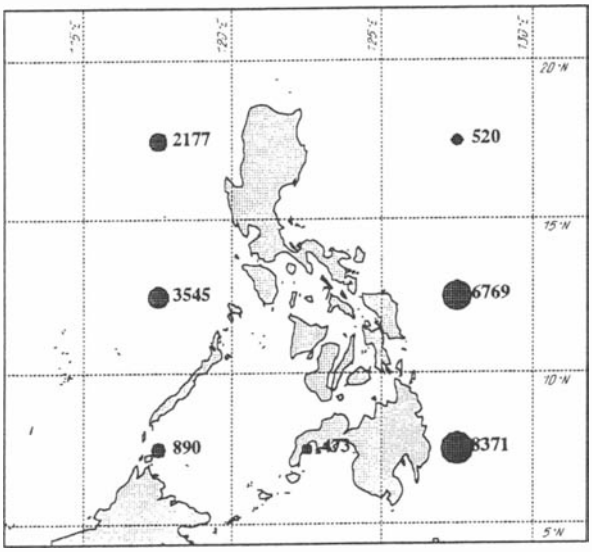
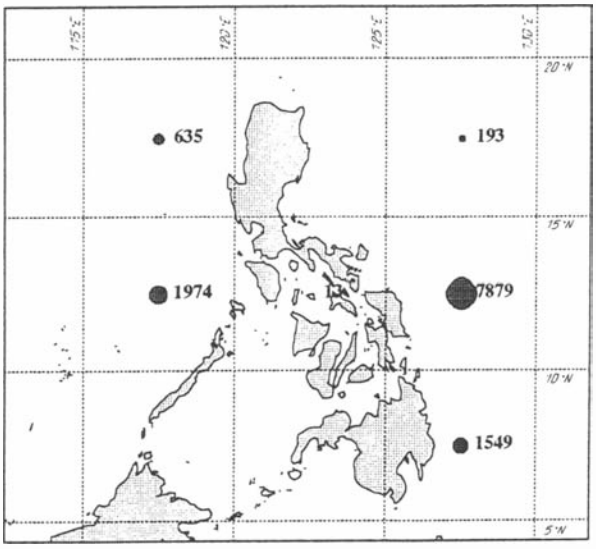


1977

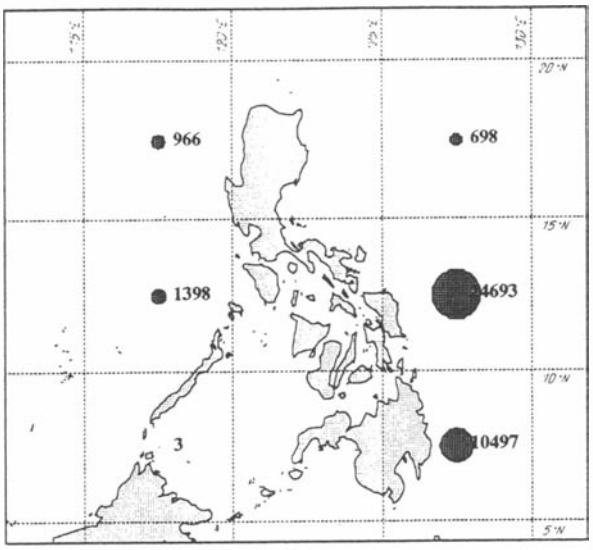


1978

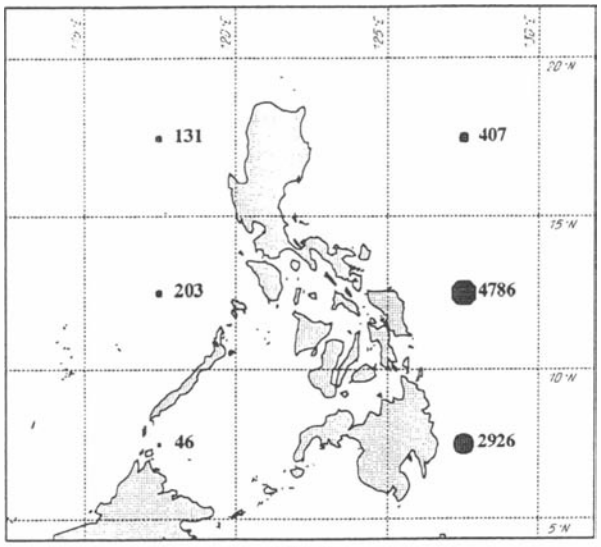


1979

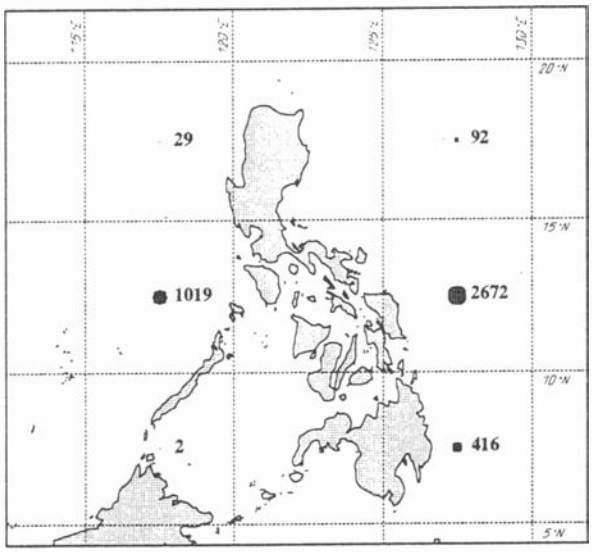
Figure 10 Distribution of Yellowfin catch (Number of fish) for Japanese longline vessels fishing in the vicinity of the Philippines, 1980-1985



1980



1981



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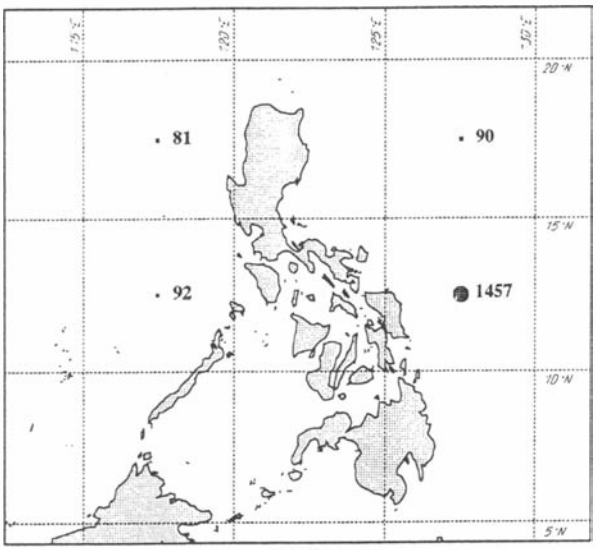
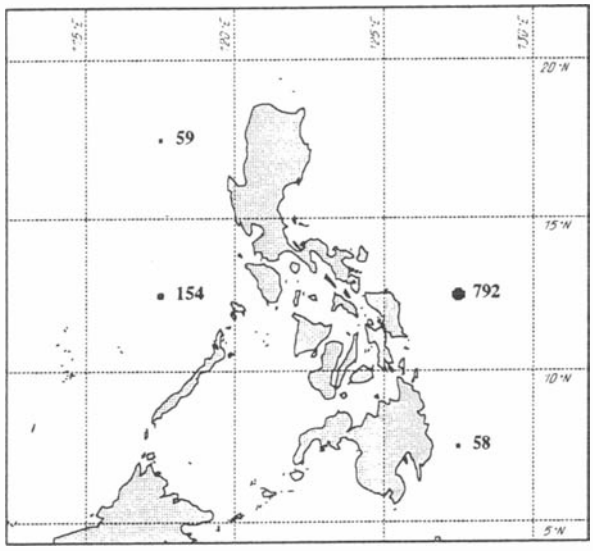
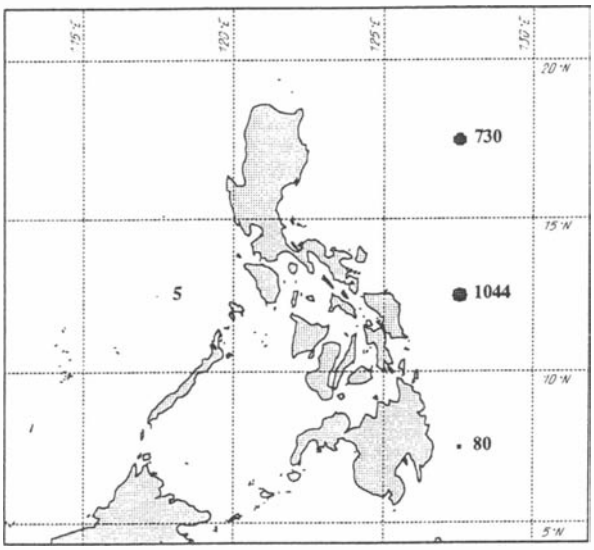


1983

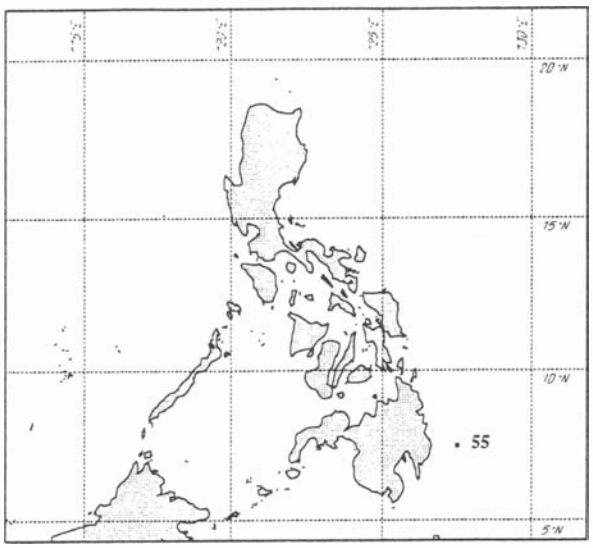


1984

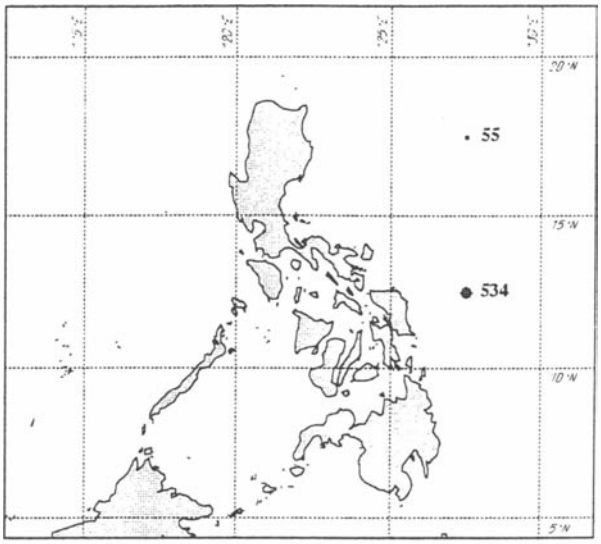


1985

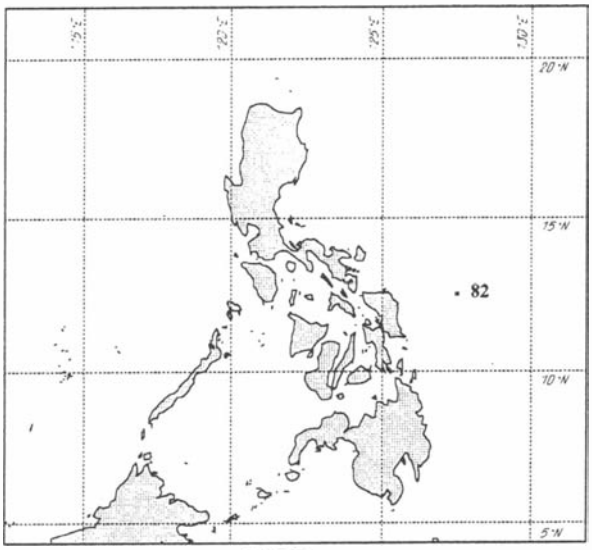
Figure 11 Distribution of Yellowfin catch (Number of fish) for Japanese longline vessels fishing in the vicinity of the Philippines, 1986-1991



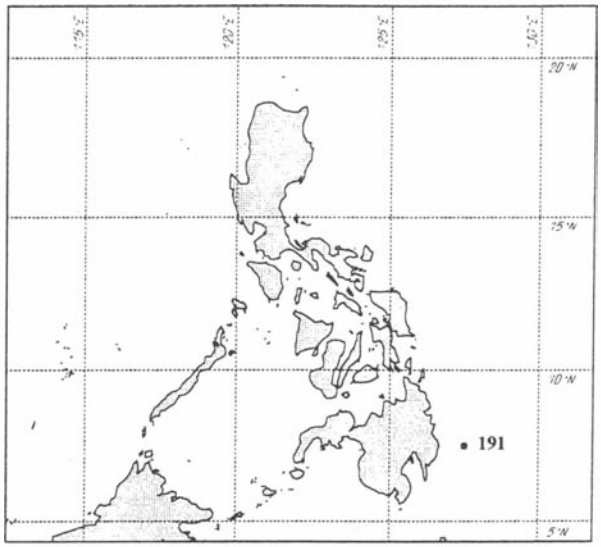
1986



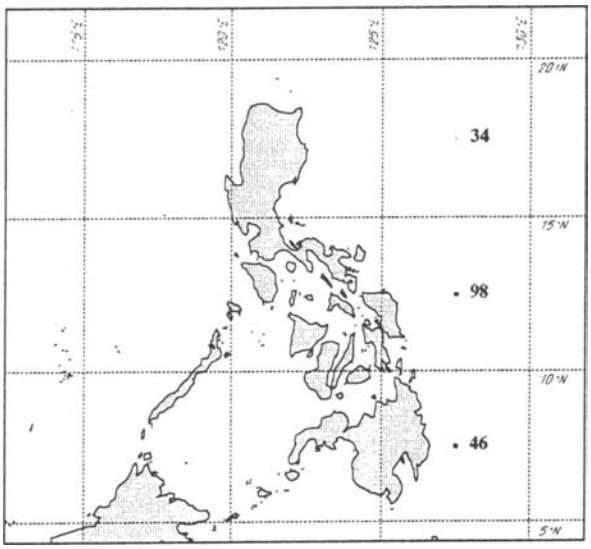
1987



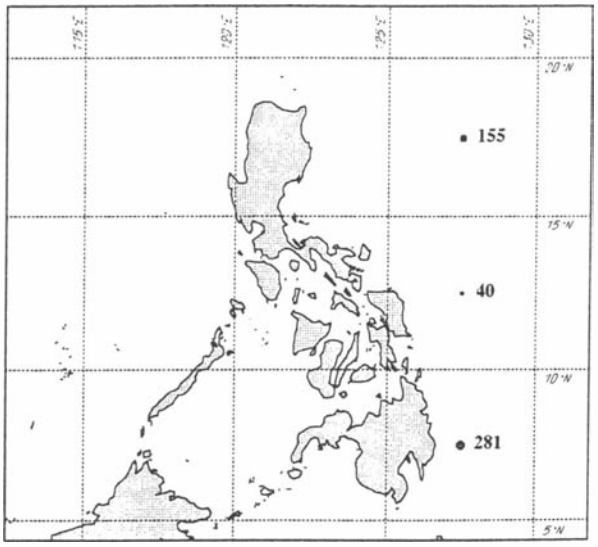
1988



1989



1990



1991

Figure12 Distribution of Yellowfin catch (Number of fish) for Japanese longline vessels fishing in the vicinity of the Philippines, 1992

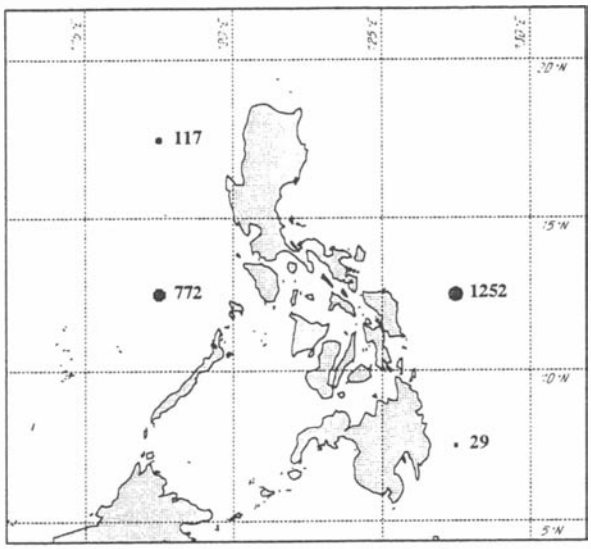
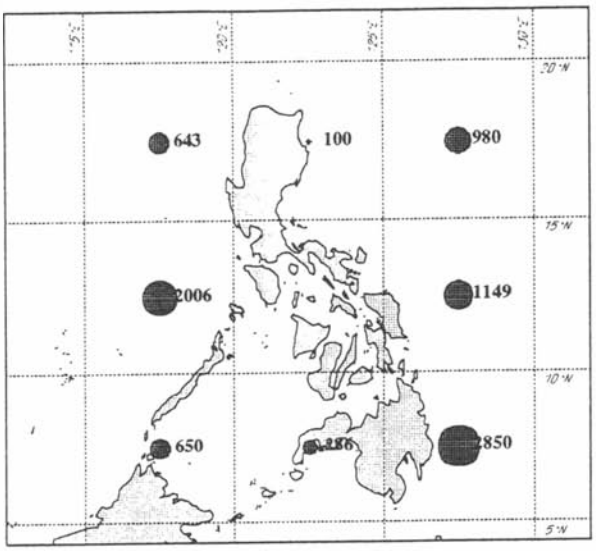
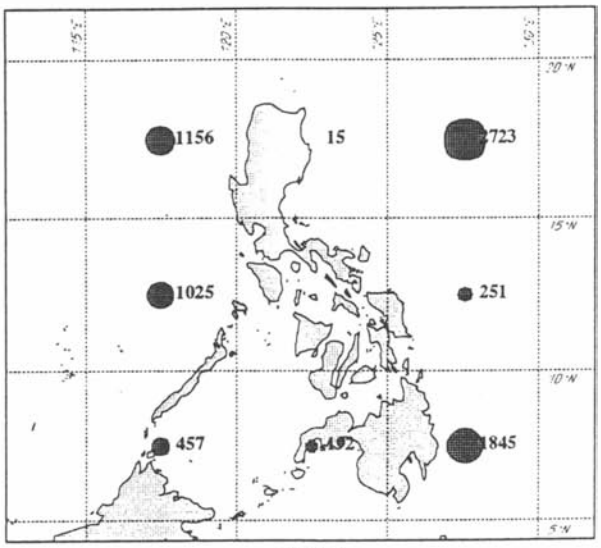


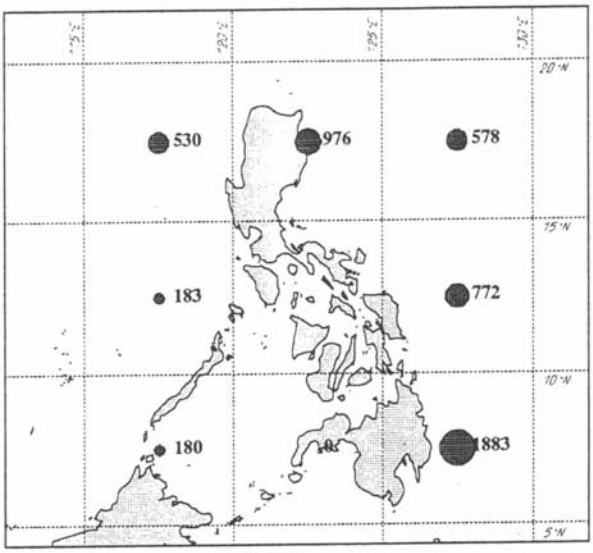
Figure 13 Distribution of Bigeye catch (Number of fish) for Japanese longline vessels fishing in the vicinity of the Philippines, 1962-1967



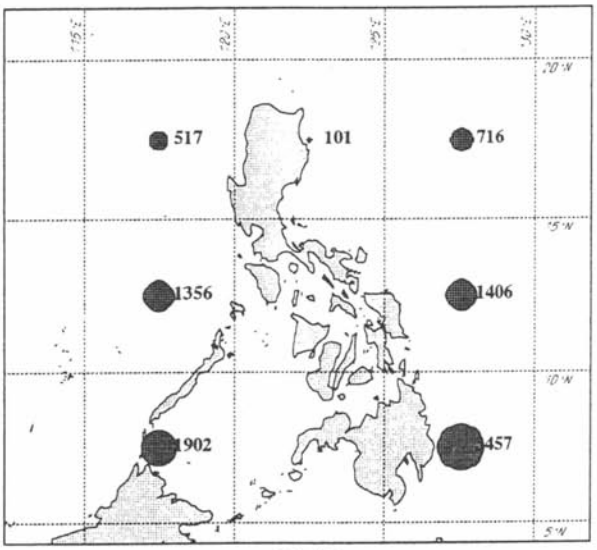
1962



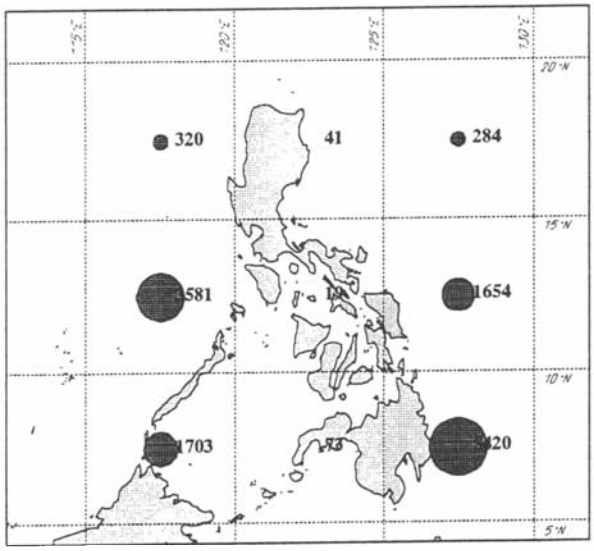
1963



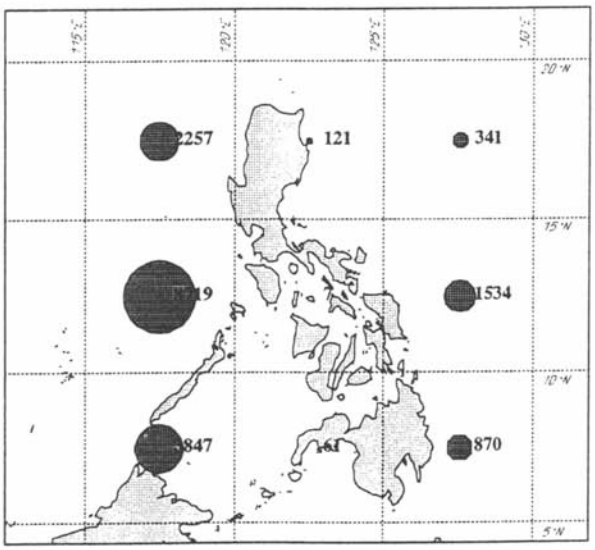
1964



1965

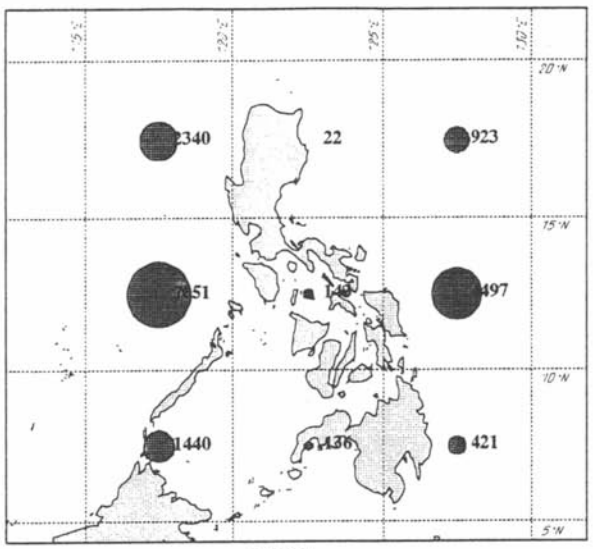


1966

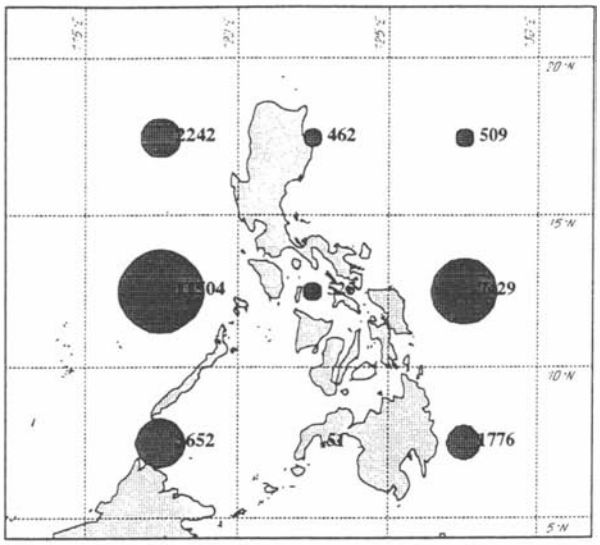


1967

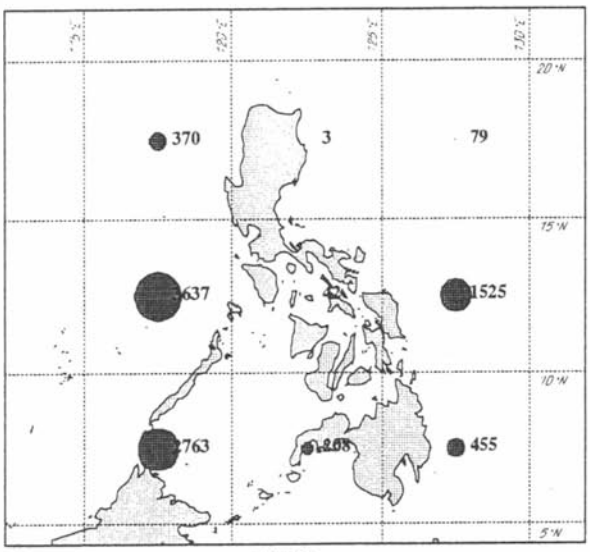
Figure 14 Distribution of Bigeye catch (Number of fish) for Japanese longline vessels fishing in the vicinity of the Philippines, 1968-1973



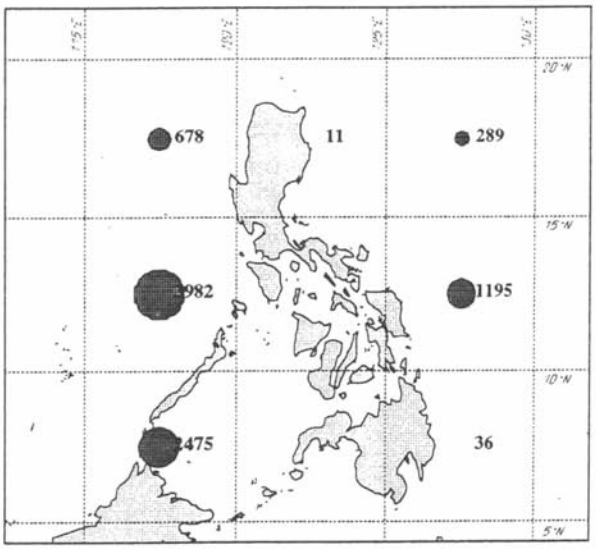
1968



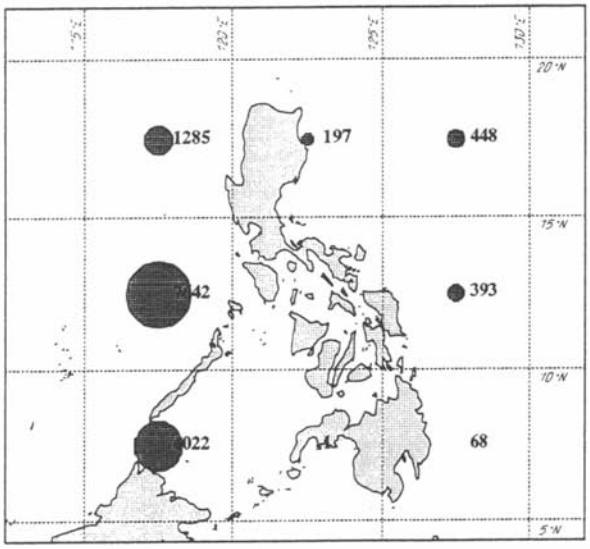
1969



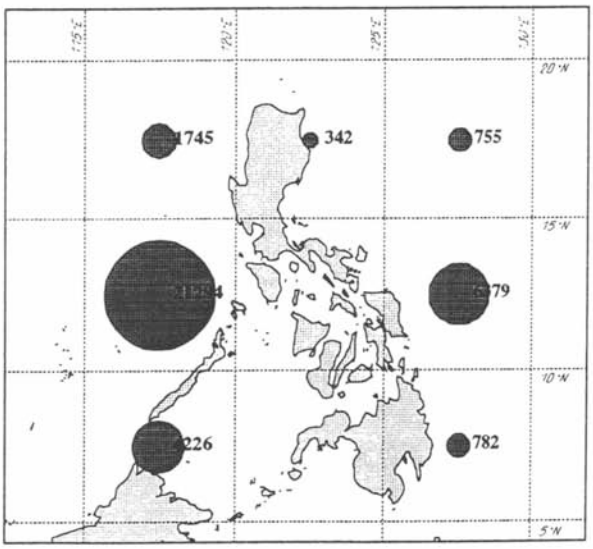
1970



1971

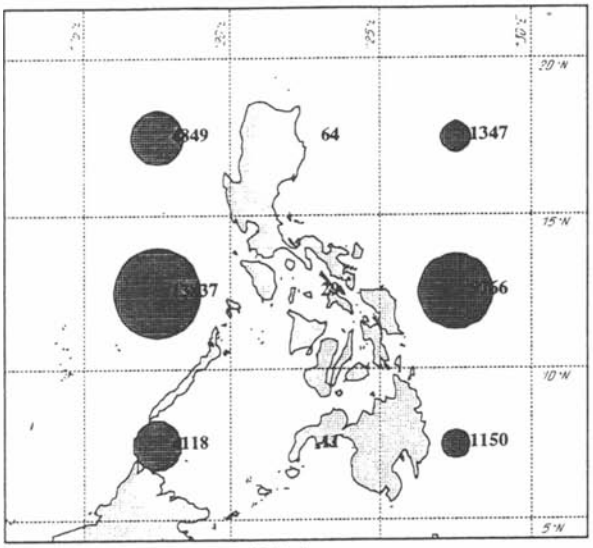


1972

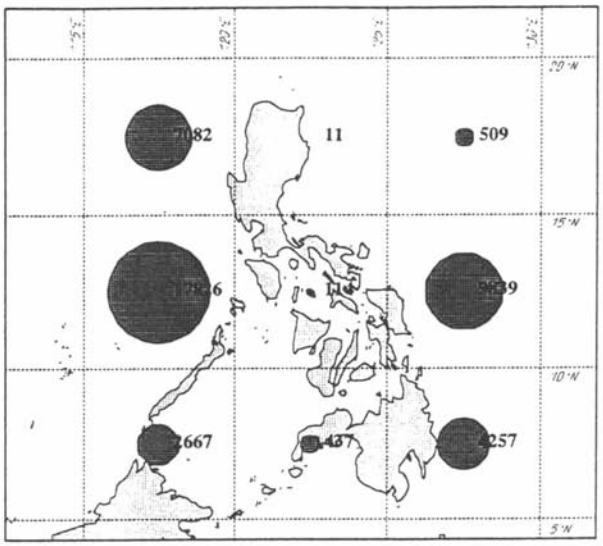


1973

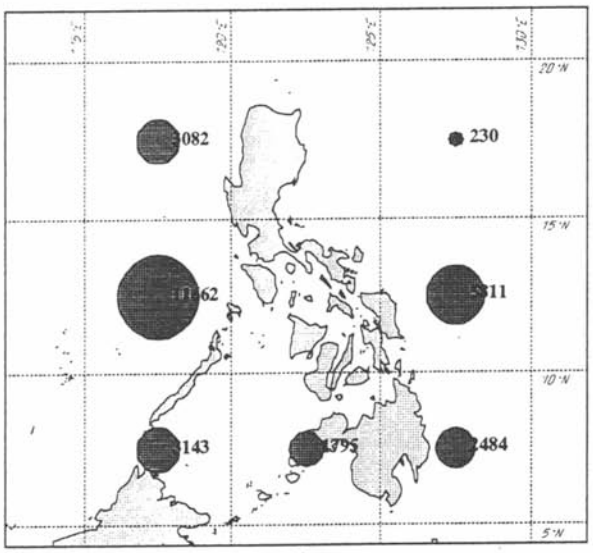
Figure 15 Distribution of Bigeye catch (Number of fish) for Japanese longline vessels fishing in the vicinity of the Philippines, 1974-1979



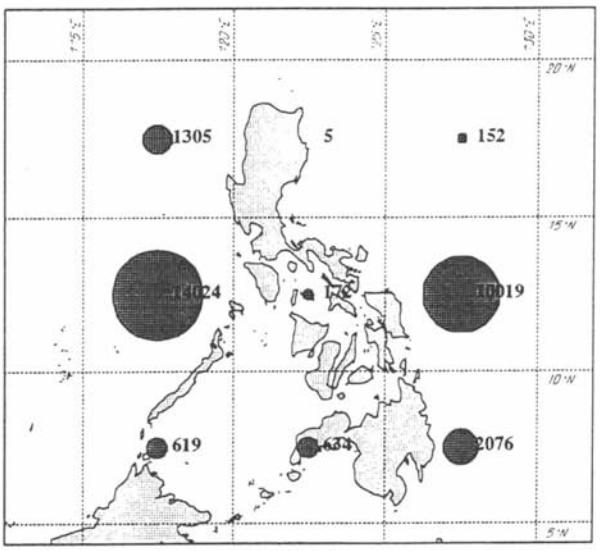
1974



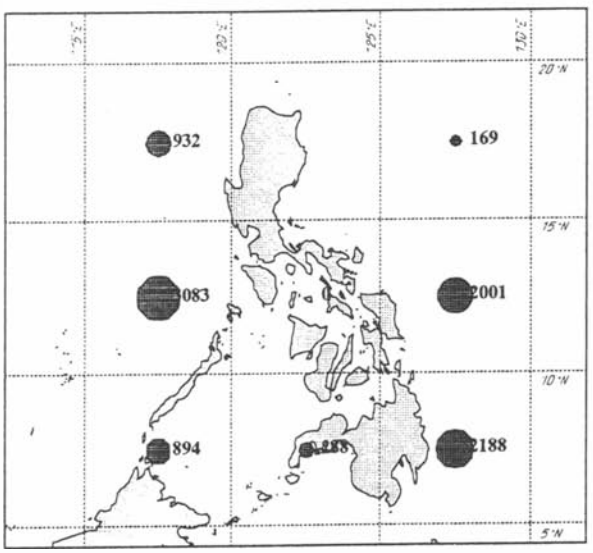
1975



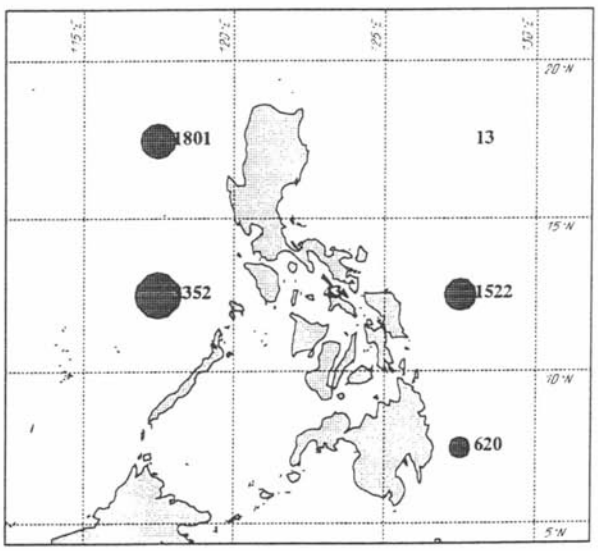
1976



1977

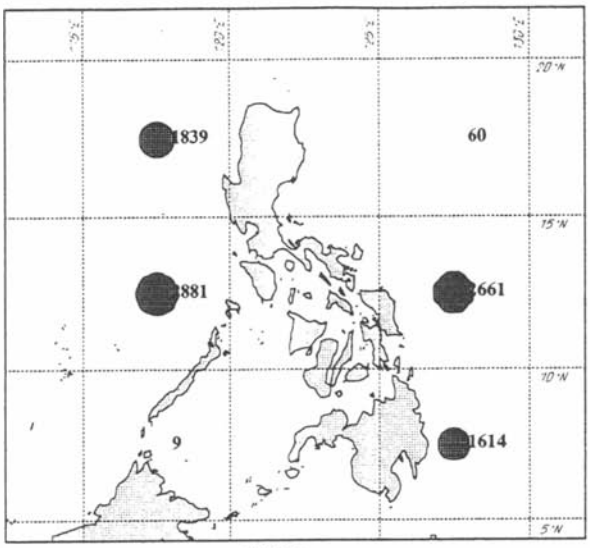


1978

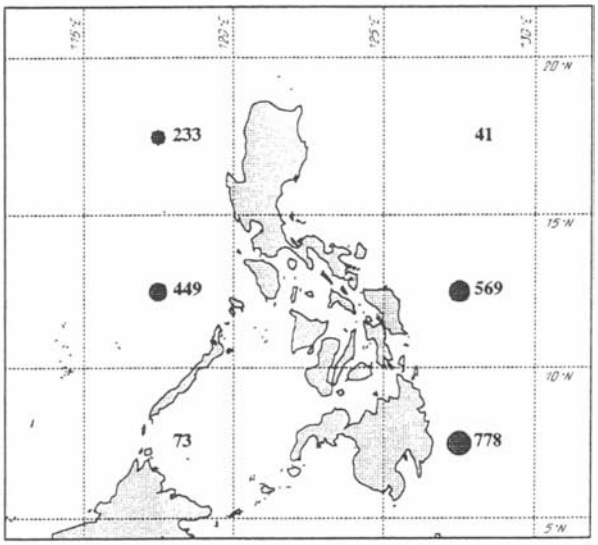


1979

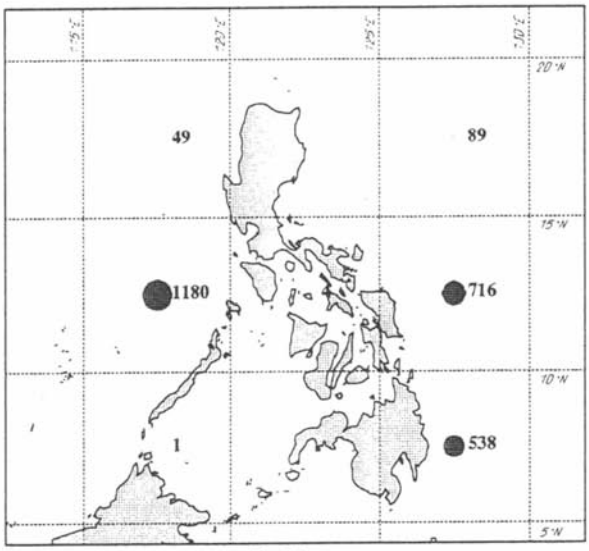
Figure16 Distribution of Bigeye catch (Number of fish) for Japanese longline vessels fishing in the vicinity of the Philippines, 1980-1985



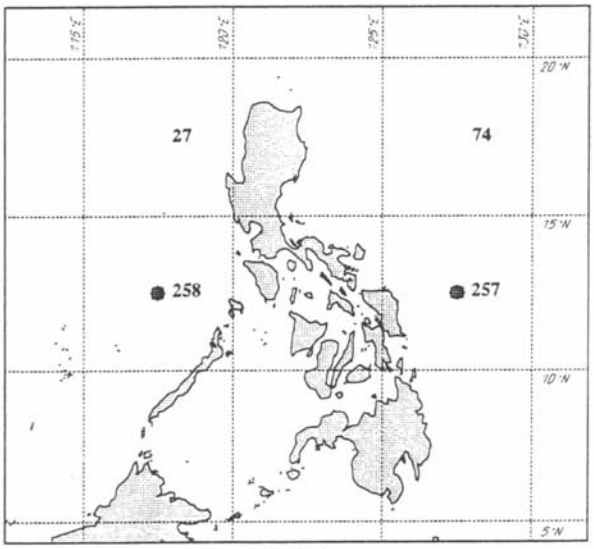
1980



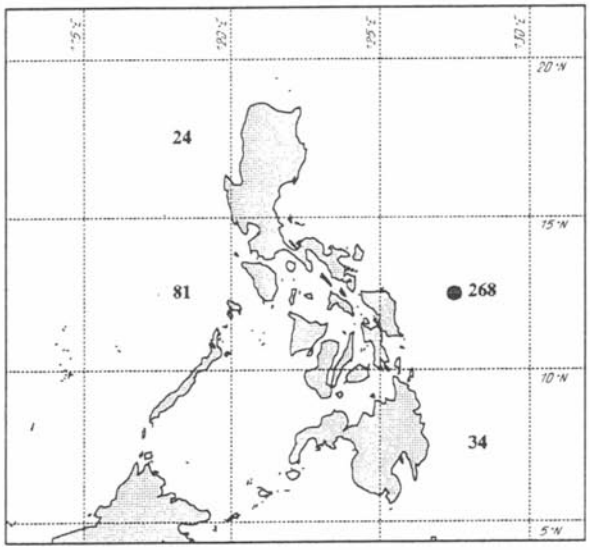
1981



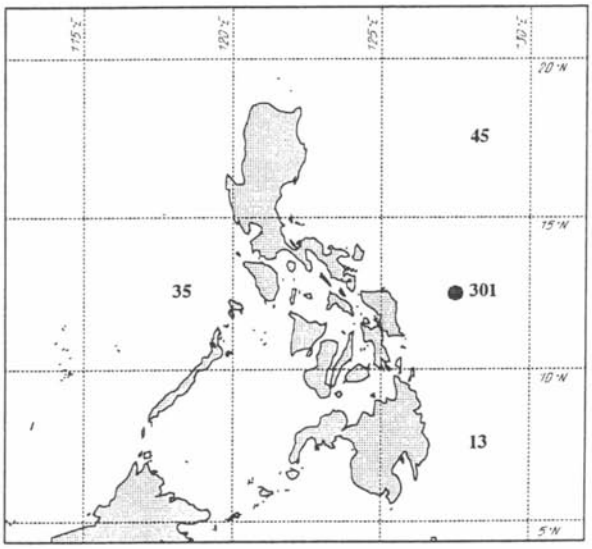
1982



1983

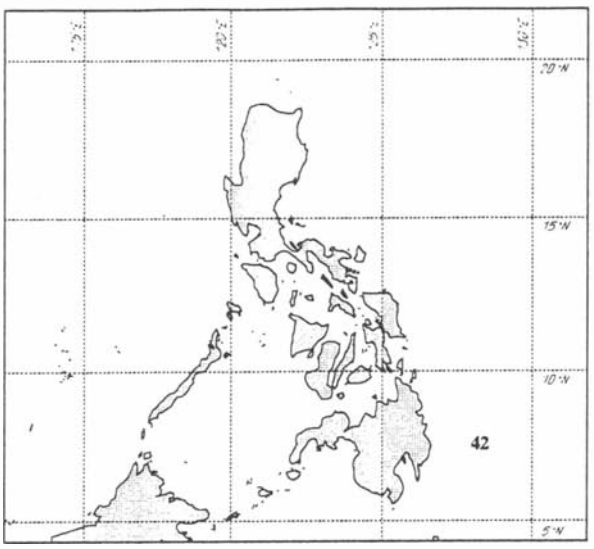


1984

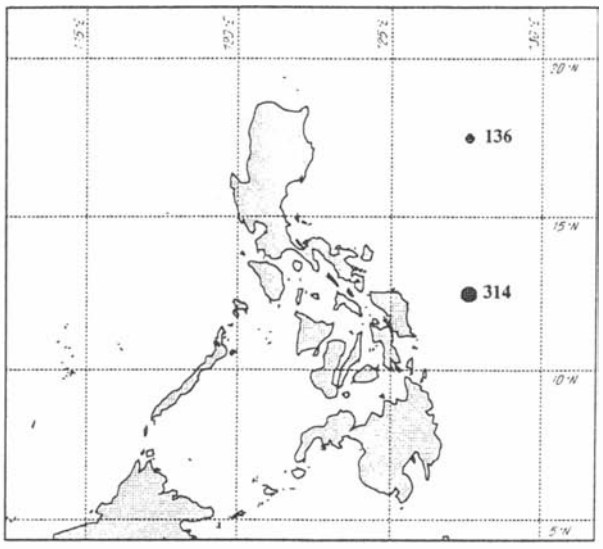


1985

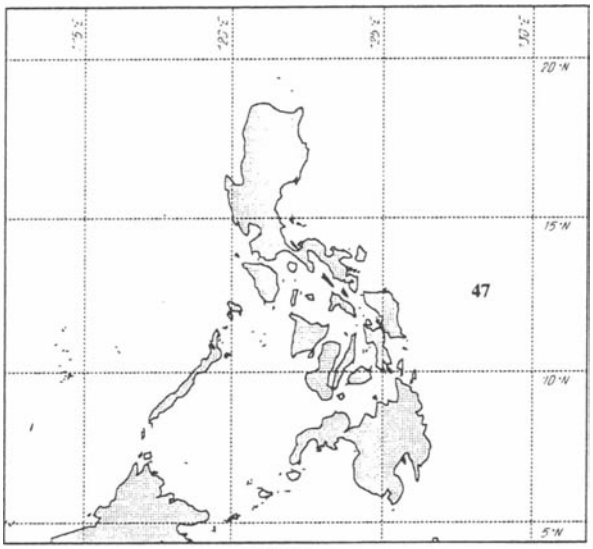
Figure 17 Distribution of Bigeye catch (Number of fish) for Japanese longline vessels fishing in the vicinity of the Philippines, 1986-1991



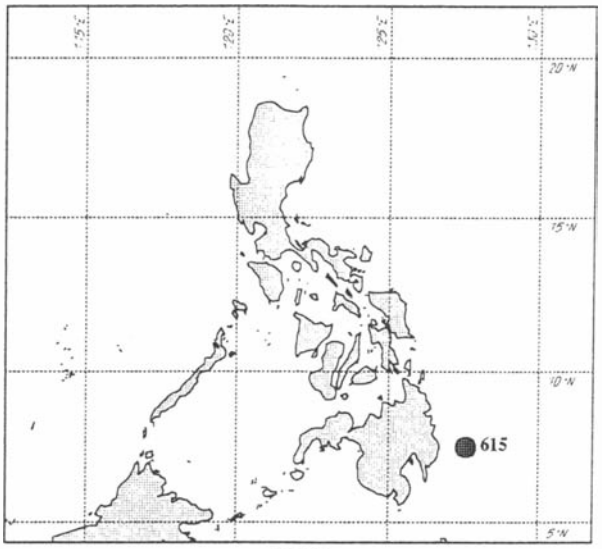
1986



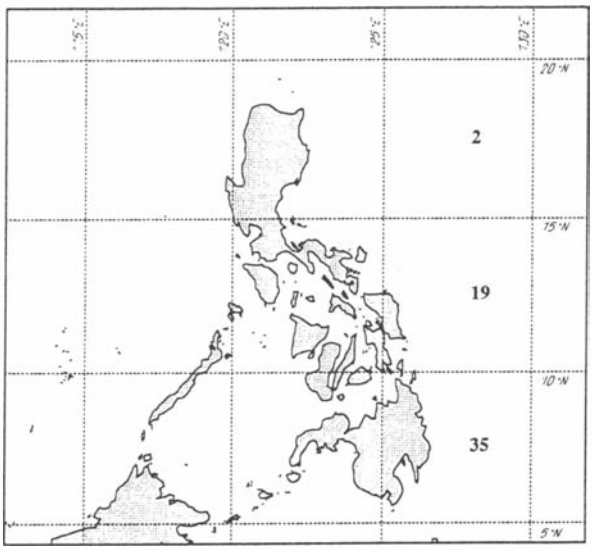
1987



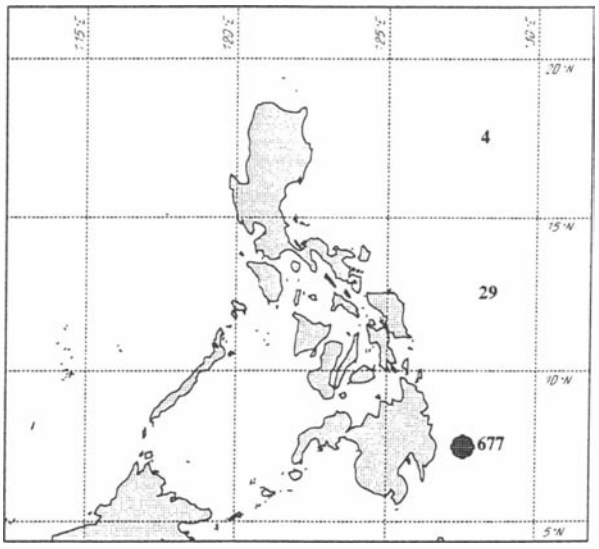
1988



1989



1990



1991

Figure 18 Distribution of Bigeye catch (Number of fish) for Japanese longline vessels fishing in the vicinity of the Philippines, 1992

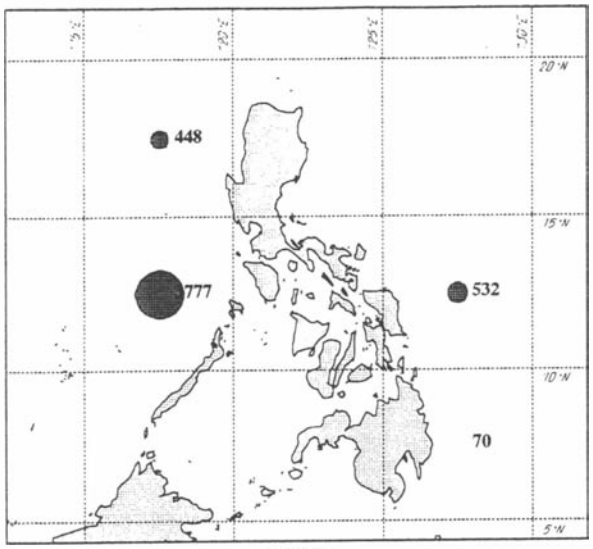
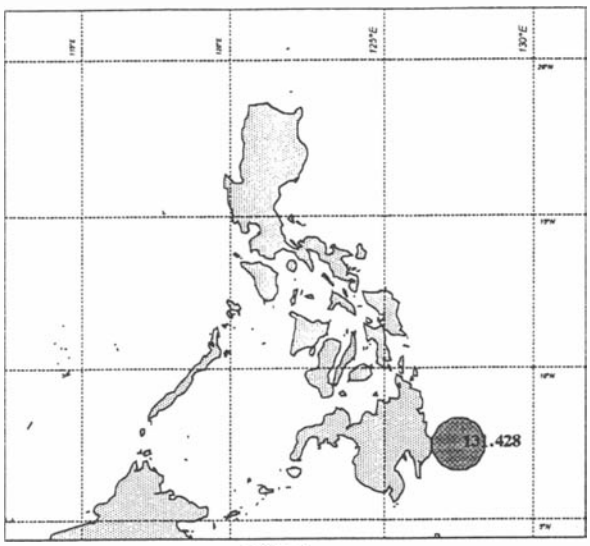
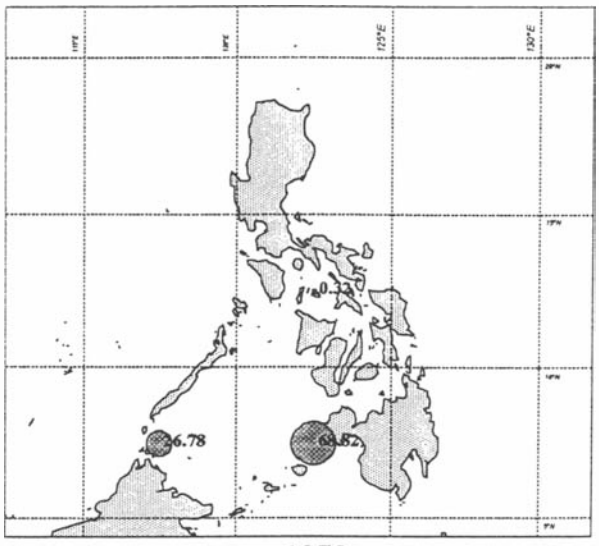


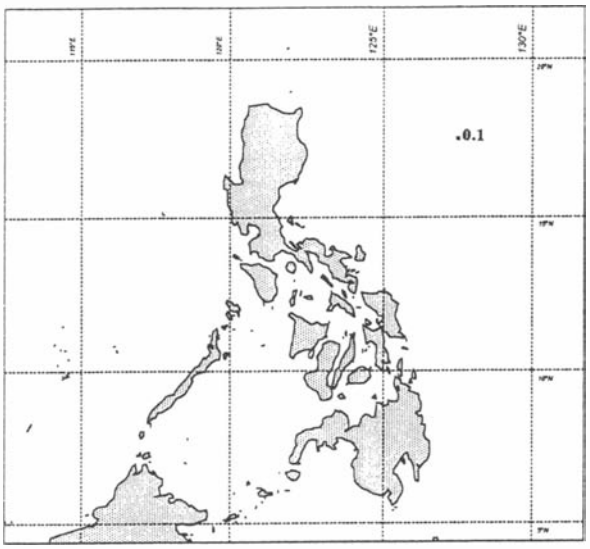
Figure 19 Distribution of Yellowfin catch (Metric Tons) for Taiwanese distant water longline vessels fishing in the vicinity of the Philippines - 1974 - 1978 - 1981.



1974

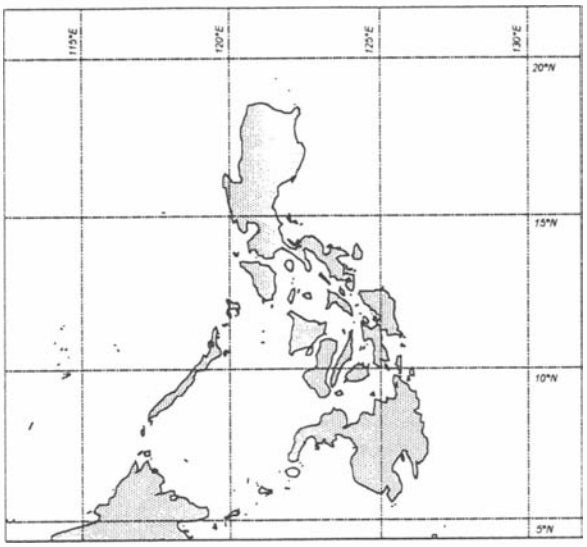


1978

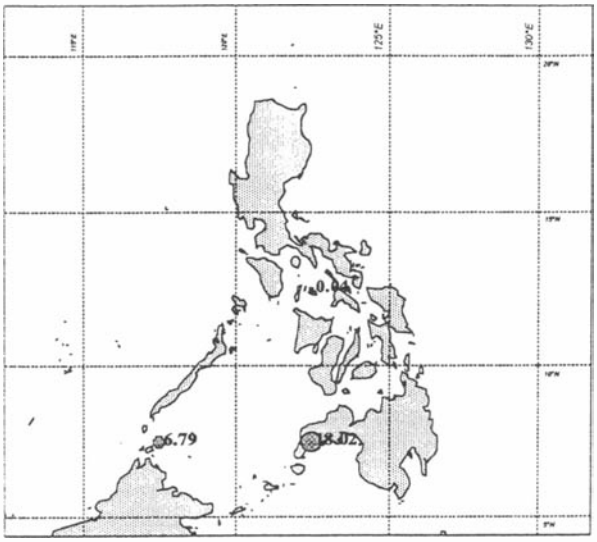


1981

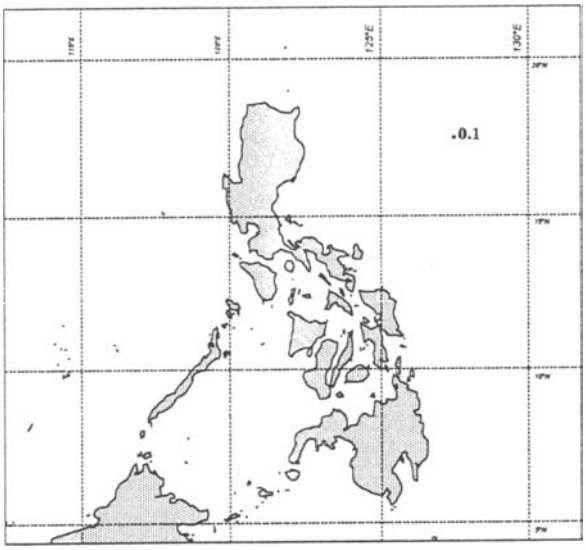
Figure 20 Distribution of Bigeye catch (Metric Tons) for Taiwanese distant water longline vessels fishing in the vicinity of the Philippines - 1974 - 1978 - 1981.



1974



1978



1981

Table 1. Catch statistics for Japanese longline vessels fishing in the Philippine study area

Source of data : Fisheries Agency of Japan

Units : Catch - metric tonnes; CPUE - no. of fish per 100 hooks; TOTAL - Total Yellowfin and Bigeye

Month	100s of Hooks	YELLOWFIN Catch	YELLOWFIN CPUE	BIGEYE Catch	BIGEYE CPUE	TOTAL Catch	TOTAL CPUE
62/01	2585	95.02	1.45	29.03	0.36	124.06	1.81
62/02	2835	74.3	1.03	19.65	0.22	93.96	1.26
62/03	4268	125.53	1.16	68.37	0.52	193.9	1.68
62/04	2093	29.75	0.56	11.89	0.18	41.64	0.74
62/05	617	14.48	0.93	6.86	0.36	21.34	1.28
62/06	1319	44	1.32	27.48	0.67	71.48	1.99
62/07	487	9.05	0.73	8.63	0.57	17.69	1.3
62/08	252	24.62	3.85	2.52	0.32	27.14	4.17
62/09	480	20.95	1.72	11.21	0.75	32.16	2.47
62/10	2162	167.25	3.05	41.76	0.62	209.01	3.67
62/11	1791	96.04	2.11	19.75	0.36	115.79	2.47
62/12	2225	83.89	1.49	21.86	0.32	105.75	1.8
	21114	**784.88**	**1.47**	**269.01**	**0.41**	**1053.92**	**1.88**
63/01	2189	84.37	1.52	11.61	0.17	95.99	1.69
63/02	627	10.47	0.66	11.99	0.62	22.46	1.27
63/03	87	1.14	0.52	0.93	0.34	2.07	0.86
63/04	2176	30.69	0.56	15.8	0.23	46.49	0.79
63/05	582	6.54	0.44	0.78	0.04	7.32	0.49
63/06	259	3.58	0.54	0.56	0.07	4.13	0.61
63/07	129	2.87	0.88	1.71	0.43	4.57	1.3
63/08	0	0	0	0	0	0	0
63/09	163	7.86	1.9	3.51	0.69	11.37	2.6
63/10	2048	83.36	1.6	25.77	0.41	109.13	2.01
63/11	9470	196.31	0.82	112.9	0.38	309.21	1.2
63/12	5055	182.54	1.42	52.41	0.33	234.95	1.76
	22785	**609.73**	**1.06**	**237.97**	**0.34**	**847.69**	**1.4**
64/01	1636	60.03	1.45	12.58	0.25	72.6	1.69
64/02	1072	33.91	1.25	10.65	0.32	44.56	1.57
64/03	1414	42.15	1.18	10.12	0.23	52.27	1.41
64/04	869	43.09	1.96	5.78	0.21	48.86	2.17
64/05	2582	86.35	1.32	5.65	0.07	92	1.39
64/06	1963	51.05	1.03	31.67	0.52	82.72	1.55
64/07	344	18.66	2.14	1.93	0.18	20.59	2.32
64/08	0	0	0	0	0	0	0
64/09	171	9.89	2.28	1.83	0.35	11.72	2.63
64/10	2721	134.99	1.96	31.67	0.37	166.66	2.33
64/11	3360	185.28	2.17	27.7	0.27	212.98	2.44
64/12	1964	101.54	2.04	18.85	0.31	120.39	2.35
	18096	**766.94**	**1.67**	**158.43**	**0.28**	**925.35**	**1.95**
65/01	597	21.58	1.43	10.62	0.57	32.2	2
65/02	1313	26.78	0.8	22.23	0.55	49.01	1.35
65/03	3032	115.97	1.51	18.97	0.2	134.94	1.71
65/04	4410	85.16	0.76	20.62	0.15	105.78	0.91
65/05	3275	115.36	1.39	15.56	0.15	130.92	1.54
65/06	1314	43.92	1.32	6.05	0.15	49.98	1.47
65/07	852	46.08	2.13	10.9	0.41	56.98	2.54
65/08	1165	15.37	0.52	9.47	0.26	24.84	0.78
65/09	719	39.38	2.16	10.99	0.49	50.38	2.65
65/10	3359	206.73	2.43	50.39	0.48	257.13	2.91
65/11	6257	284.72	1.79	77.84	0.4	362.56	2.19
65/12	3467	145.59	1.66	39.93	0.37	185.52	2.03
	29760	**1146.64**	**1.52**	**293.57**	**0.32**	**1440.24**	**1.84**

Table 1. Catch statistics for Japanese longline vessels fishing in the Philippine study area

Source of data : Fisheries Agency of Japan

Units : Catch - metric tonnes; CPUE - no. of fish per 100 hooks; TOTAL - Total Yellowfin and Bigeye

Month	100s of Hooks	YELLOWFIN Catch	YELLOWFIN CPUE	BIGEYE Catch	BIGEYE CPUE	TOTAL Catch	TOTAL CPUE
66/01	1848	65.89	1.41	26.61	0.46	92.5	1.87
66/02	320	13.85	1.71	4.87	0.49	18.72	2.2
66/08	0	0	0	0	0	0	0
66/04	2907	58.28	0.79	17.02	0.19	75.29	0.98
66/05	3227	50.49	0.62	9.44	0.09	59.93	0.71
66/06	1683	58.33	1.37	16.92	0.32	75.25	1.69
66/07	1228	43.14	1.39	11.83	0.31	54.97	1.7
66/08	0	0	0	0	0	0	0
66/09	2838	113.41	1.58	48.59	0.55	162	2.13
66/10	6741	264.3	1.55	101.44	0.48	365.74	2.03
66/11	7600	379.03	1.97	118.64	0.5	497.67	2.47
66/12	3540	141.89	1.58	51.23	0.47	193.12	2.05
	31932	**1188.61**	**1.47**	**406.59**	**0.41**	**1595.19**	**1.88**
67/01	1622	90.99	2.21	22.7	0.45	113.69	2.66
67/02	2148	98.73	1.81	27.42	0.41	126.14	2.22
67/03	1884	46.92	0.98	28.94	0.49	75.85	1.48
67/04	3082	67.94	0.87	22.32	0.23	90.26	1.1
67/05	5789	59.55	0.41	24.47	0.14	84.01	0.54
67/06	3487	117.26	1.33	33.94	0.31	151.2	1.64
67/07	844	22.93	1.07	10.99	0.42	33.92	1.49
67/08	724	22.32	1.22	10.06	0.45	32.38	1.66
67/09	4946	199.1	1.59	109.92	0.72	309.02	2.3
67/10	7351	426.91	2.29	184.13	0.81	611.04	3.1
67/11	1648	84.73	2.03	26.3	0.51	111.03	2.54
67/12	2985	139.2	1.84	50.18	0.54	189.38	2.38
	36510	**1376.58**	**1.49**	**551.37**	**0.49**	**1927.92**	**1.98**
68/01	5235	189.29	1.43	60.05	0.37	249.34	1.8
68/02	1428	52.32	1.44	29.75	0.67	82.06	2.12
68/03	7401	202.52	1.08	86.97	0.38	289.5	1.46
68/04	9835	212.44	0.85	81.23	0.27	293.67	1.12
68/05	6513	90.15	0.55	39.34	0.19	129.5	0.74
68/06	5095	83.79	0.65	32.54	0.21	116.33	0.85
68/07	1430	22.49	0.62	17.95	0.4	40.44	1.02
68/08	851	17.73	0.82	6.58	0.25	24.31	1.07
68/09	1413	43.47	1.21	20.49	0.47	63.96	1.68
68/10	2325	145.57	2.47	41.73	0.58	187.3	3.05
68/11	2510	112.4	1.77	44.93	0.58	157.32	2.34
68/12	3726	99.41	1.05	65.45	0.57	164.86	1.62
	47762	**1271.58**	**1.05**	**527.01**	**0.36**	**1798.59**	**1.41**
69/01	3680	77.83	0.83	60.83	0.53	138.66	1.37
69/02	4629	142.09	1.21	61.54	0.43	203.63	1.64
69/03	7330	189.31	1.02	93.43	0.41	282.74	1.43
69/04	11688	218.83	0.74	162.64	0.45	381.47	1.19
69/05	11838	212.77	0.71	111.1	0.3	323.87	1.01
69/06	6342	132.56	0.82	77.41	0.39	209.96	1.22
69/07	1491	24.52	0.65	19.81	0.43	44.33	1.08
63/08	0	0	0	0	0	0	0
69/09	2143	93.98	1.73	54.18	0.81	148.17	2.54
69/10	6734	336.15	1.97	105.79	0.51	441.93	2.47
69/11	4846	244.9	1.99	86.82	0.58	331.72	2.57
69/12	2562	149.32	2.3	40.52	0.51	189.84	2.81
	63283	**1822.26**	**1.14**	**874.07**	**0.44**	**2696.32**	**1.58**

Table 1. Catch statistics for Japanese longline vessels fishing in the Philippine study area

Source of data : Fisheries Agency of Japan

Units : Catch - metric tonnes; CPUE - no. of fish per 100 hooks; TOTAL - Total Yellowfin and Bigeye

Month	100s of Hooks	YELLOWFIN Catch	YELLOWFIN CPUE	BIGEYE Catch	BIGEYE CPUE	TOTAL Catch	TOTAL CPUE
70/01	607	19.4	1.26	13.44	0.71	32.85	1.97
70/02	389	12.45	1.26	6.37	0.53	18.82	1.79
70/03	785	32.11	1.61	12.26	0.5	44.37	2.12
70/04	744	19.4	1.03	2.79	0.12	22.19	1.15
70/05	1295	91.42	2.78	13.23	0.33	104.65	3.11
70/06	6502	251.55	1.53	41.48	0.21	293.03	1.73
70/07	1097	24.78	0.89	4.75	0.14	29.53	1.03
70/08	257	14.33	2.2	3.69	0.46	18.02	2.66
70/09	2106	57.49	1.08	69.4	1.06	126.89	2.14
70/10	2861	113.59	1.57	60.89	0.69	174.48	2.25
70/11	1185	48.36	1.61	19.78	0.54	68.14	2.15
70/12	1404	65.66	1.84	33.91	0.78	99.56	2.62
	19232	**750.54**	**1.54**	**281.99**	**0.47**	**1032.53**	**2.01**
71/01	726	17.07	0.93	10.81	0.48	27.87	1.41
71/02	2103	61.6	1.16	35.33	0.54	96.93	1.7
71/03	1114	32.44	1.15	12.02	0.35	44.45	1.5
71/04	1248	28.86	0.91	31.73	0.82	60.59	1.73
71/05	80	1.78	0.88	0.99	0.4	2.77	1.28
71/06	134	2.59	0.76	1.86	0.45	4.45	1.21
71/07	41	0.41	0.39	0.43	0.34	0.84	0.73
71/08	342	8.72	1.01	15	1.41	23.72	2.42
71/09	1406	44.41	1.25	33.91	0.78	78.31	2.02
71/10	2495	128.8	2.04	28.22	0.36	157.03	2.4
71/11	2938	175.01	2.35	66.66	0.73	241.67	3.08
71/12	1801	58.78	1.29	32.11	0.57	90.89	1.86
	14428	**560.47**	**1.53**	**269.07**	**0.6**	**829.52**	**2.13**
72/01	1859	44.23	0.94	53.59	0.93	97.82	1.87
72/02	1311	41.31	1.24	22.67	0.56	63.98	1.8
72/03	678	22.8	1.33	16.8	0.8	39.6	2.12
72/04	2854	43.54	0.6	19.56	0.22	63.1	0.82
72/05	540	8.7	0.64	2.7	0.16	11.4	0.8
72/06	131	1.12	0.34	0.22	0.05	1.33	0.39
72/07	253	2.66	0.42	6.77	0.86	9.43	1.28
72/08	853	16.18	0.75	1	0.38	26.18	1.13
72/09	3920	125.91	1.27	102.78	0.84	228.69	2.11
72/10	3535	266.81	2.98	91.32	0.83	358.13	3.81
72/11	3357	192.33	2.26	62.1	0.6	254.43	2.85
72/12	2344	130.27	2.19	47.94	0.66	178.22	2.85
	21635	**895.86**	**1.63**	**427.45**	**0.65**	**1332.31**	**2.28**
73/01	2849	79.17	1.1	46.05	0.52	125.22	1.62
73/02	7461	322.68	1.71	251.38	1.09	574.06	2.79
73/03	6013	190.05	1.25	156.34	0.84	346.38	2.08
73/04	2256	69.49	1.21	23.57	0.34	93.05	1.55
73/05	4901	140.72	1.13	77.35	0.51	218.07	1.64
73/06	3940	102.96	1.03	51.2	0.42	154.16	1.45
73/07	471	9.46	0.79	10.46	0.72	19.92	1.51
73/08	637	17.85	1.11	12.45	0.63	30.3	1.73
73/09	3601	110.57	1.21	72.44	0.65	183.01	1.86
73/10	7289	259.41	1.4	122.65	0.54	382.05	1.95
73/11	7483	291.79	1.54	186.89	0.8	478.68	2.34
73/12	4040	137.86	1.35	92.22	0.74	230.08	2.08
	50941	**1732.01**	**1.34**	**1103**	**0.7**	**2834.98**	**2.04**

Table 1. Catch statistics for Japanese longline vessels fishing in the Philippine study area

Source of data : Fisheries Agency of Japan

Units : Catch - metric tonnes; CPUE - no. of fish per 100 hooks; TOTAL - Total Yellowfin and Bigeye

Month	100s of Hooks	YELLOWFIN Catch	YELLOWFIN CPUE	BIGEYE Catch	BIGEYE CPUE	TOTAL Catch	TOTAL CPUE
74/01	2228	59.93	1.06	43.87	0.63	103.8	1.69
74/02	5190	231.54	1.76	91.01	0.56	322.54	2.32
74/03	8476	310.05	1.44	62.57	0.24	372.62	1.68
74/04	11626	567.38	1.92	90.98	0.25	658.36	2.18
74/05	3936	77.68	0.78	39.9	0.33	117.58	1.1
74/06	3875	212.01	2.16	25.24	0.21	237.25	2.37
74/07	2383	57.8	0.96	34.47	0.47	92.26	1.42
74/08	5898	136.97	0.92	133.73	0.73	270.7	1.65
74/09	8413	436.62	2.05	122.43	0.47	559.05	2.52
74/10	11312	595.15	2.07	141.06	0.4	736.21	2.48
74/11	14761	1005.73	2.69	169.72	0.37	1175.45	3.06
74/12	6743	258.77	1.51	137.09	0.65	395.86	2.17
	84841	**3949.63**	**1.84**	**1092.07**	**0.41**	**5041.68**	**2.25**
75/01	3626	95.63	1.04	64.37	0.57	160	1.61
75/02	6852	123.45	0.71	198.63	0.93	322.08	1.64
75/03	8411	181.83	0.85	194.09	0.74	375.92	1.6
75/04	8258	341.5	1.63	133.76	0.52	475.26	2.15
75/05	13386	1066.74	3.14	140.28	0.34	1207.03	3.48
75/06	9535	683.58	2.83	76.72	0.26	760.3	3.09
75/07	6118	264.86	1.71	59.93	0.32	324.79	2.02
75/08	3613	108.77	1.19	33.01	0.29	141.78	1.48
75/09	4205	101.41	0.95	51.95	0.4	153.36	1.35
75/10	7990	457.72	2.26	132.61	0.53	590.34	2.79
75/11	10268	465.05	1.79	192.67	0.6	657.72	2.39
75/12	3078	118.68	1.52	49.12	0.51	167.81	2.03
	85340	**4009.22**	**1.85**	**1327.14**	**0.5**	**5336.39**	**2.35**
76/01	2559	73.16	1.13	53.5	0.67	126.66	1.8
76/02	2609	49.05	0.74	40.37	0.5	89.41	1.24
76/03	6665	190.07	1.12	172.89	0.84	362.96	1.96
76/04	4930	154.16	1.23	56.85	0.37	211.02	1.6
76/05	3178	106.26	1.32	30.65	0.31	136.9	1.63
76/06	6741	325.77	1.91	84.64	0.4	410.42	2.31
76/07	2758	91.14	1.3	31.36	0.37	122.5	1.67
76/08	3176	89.06	1.11	36.33	0.37	125.39	1.47
76/09	3825	101.59	1.05	55.58	0.47	157.17	1.52
76/10	10022	294.51	1.16	180	0.58	474.5	1.74
76/11	4018	122.79	1.21	68.28	0.55	191.07	1.75
76/12	3732	98.83	1.04	65.39	0.56	164.22	1.61
	54213	**1696.39**	**1.23**	**875.84**	**0.52**	**2572.22**	**1.75**
77/01	1694	44.48	1.04	29	0.55	73.48	1.59
77/02	4829	136.28	1.11	107.59	0.72	243.87	1.83
77/03	12253	254.69	0.82	234.09	0.62	488.78	1.43
77/04	16529	645.77	1.54	315.87	0.62	961.64	2.16
77/05	5784	186.67	1.27	92.65	0.52	279.33	1.79
77/06	1321	37.53	1.12	21.02	0.51	58.55	1.63
77/07	824	20.87	1	14.16	0.55	35.03	1.55
77/08	1007	14.86	0.58	15.18	0.49	30.04	1.07
77/09	439	5.81	0.52	6.49	0.48	12.3	1
77/10	252	3.78	0.59	3.51	0.45	7.29	1.04
77/11	801	24.7	1.22	15.87	0.64	40.57	1.85
77/12	2052	51.84	1	45.21	0.71	97.04	1.71
	47785	**1427.28**	**1.18**	**900.64**	**0.61**	**2327.92**	**1.79**

Table 1. Catch statistics for Japanese longline vessels fishing in the Philippine study area

Source of data : Fisheries Agency of Japan

Units : Catch - metric tonnes; CPUE - no. of fish per 100 hooks; TOTAL - Total Yellowfin and Bigeye

Month	100s of Hooks	YELLOWFIN Catch	YELLOWFIN CPUE	BIGEYE Catch	BIGEYE CPUE	TOTAL Catch	TOTAL CPUE
78/01	2797	66.62	0.94	42.66	0.49	109.28	1.43
78/02	559	29.95	2.11	4.94	0.28	34.89	2.4
78/03	3241	43.24	0.53	55.08	0.55	98.32	1.07
78/04	3020	90.84	1.19	59.96	0.64	150.8	1.83
78/05	1941	63.65	1.29	31.27	0.52	94.92	1.81
78/06	162	7.13	1.73	3.38	0.67	10.51	2.41
78/07	704	14	0.78	5.43	0.25	19.43	1.03
78/08	182	2.99	0.65	2.27	0.4	5.26	1.05
78/09	101	0.36	0.14	1.46	0.47	1.81	0.6
78/10	1822	171.97	3.72	26.36	0.47	198.33	4.19
78/11	1877	60.03	1.26	43.94	0.75	103.96	2.01
78/12	824	26.22	1.25	19.93	0.78	46.16	2.03
	17230	**577**	**1.32**	**296.68**	**0.55**	**873.67**	**1.87**
79/01	719	6.31	0.35	14.62	0.66	20.94	1
79/02	1464	14.46	0.39	34.62	0.76	49.08	1.15
79/03	2946	38.78	0.52	70.79	0.77	109.57	1.29
79/04	1699	88.91	2.06	23.32	0.44	112.23	2.51
79/05	1585	63.86	1.59	14.69	0.3	78.54	1.89
79/06	943	27.64	1.16	17.17	0.59	44.81	1.74
79/07	822	14.25	0.68	5.06	0.2	19.31	0.88
79/08	1315	31.37	0.94	17.73	0.43	49.1	1.37
79/09	105	1.19	0.45	0.96	0.3	2.15	0.74
79/10	242	4.49	0.73	3.23	0.43	7.72	1.16
79/11	394	14.13	1.41	8.2	0.67	22.32	2.08
79/12	596	5.1	0.34	17.85	0.96	22.95	1.3
	12830	**310.49**	**0.95**	**228.24**	**0.57**	**538.72**	**1.52**
80/01	2435	28.76	0.47	49.21	0.65	77.97	1.12
80/02	1437	23.23	0.64	51.64	1.16	74.87	1.79
80/03	3534	135.6	1.51	64.27	0.59	199.87	2.1
80/04	9780	625.43	2.52	72.91	0.24	698.33	2.76
80/05	755	30.91	1.61	5.19	0.22	36.1	1.84
80/06	874	35.5	1.6	4.35	0.16	39.85	1.76
80/07	401	7.05	0.69	1.8	0.14	8.85	0.84
80/08	263	3.07	0.46	0.37	0.05	3.44	0.51
80/09	0	0	0	0	0	0	0
80/10	1451	53.99	1.47	14.28	0.32	68.27	1.78
80/11	625	14.48	0.91	9.78	0.5	24.26	1.42
80/12	506	12.12	0.94	7.64	0.49	19.76	1.43
	22061	**970.14**	**1.73**	**281.44**	**0.41**	**1251.57**	**2.14**
81/01	837	19.98	0.94	10.37	0.4	30.35	1.34
81/02	406	7.86	0.76	2.48	0.2	10.35	0.96
81/03	2917	100.98	1.37	20.83	0.23	121.82	1.6
81/04	2330	67.99	1.15	16.05	0.22	84.04	1.37
81/05	300	6.64	0.87	2.33	0.25	8.97	1.12
81/06	426	6.92	0.64	2.3	0.17	9.22	0.81
81/07	157	1.34	0.34	0.03	0.01	1.38	0.34
81/08	97	0.58	0.24	1.09	0.36	1.67	0.6
81/09	432	1.39	0.13	3.85	0.29	5.25	0.41
81/10	331	1.42	0.17	3.26	0.32	4.68	0.49
81/11	133	0.05	0.02	1.12	0.27	1.17	0.29
81/12	338	0.36	0.04	2.83	0.27	3.18	0.31
	8704	**215.51**	**0.98**	**66.54**	**0.25**	**282.08**	**1.23**

Table 1. Catch statistics for Japanese longline vessels fishing in the Philippine study area

Source of data : Fisheries Agency of Japan

Units : Catch - metric tonnes; CPUE - no. of fish per 100 hooks; TOTAL - Total Yellowfin and Bigeye

Month	100s of Hooks	YELLOWFIN Catch	YELLOWFIN CPUE	BIGEYE Catch	BIGEYE CPUE	TOTAL Catch	TOTAL CPUE
82/01	364	3.02	0.33	4.22	0.37	7.24	0.7
82/02	1402	9.51	0.27	15.25	0.35	24.76	0.62
82/03	3783	50.85	0.53	34.84	0.3	85.68	0.83
82/04	2541	23.28	0.36	17.08	0.22	40.36	0.58
82/05	325	10.9	1.32	2.83	0.28	13.73	1.6
82/06	0	0	0	0	0	0	0
82/07	365	4.97	0.54	1.34	0.12	6.31	0.65
82/08	0	0	0	0	0	0	0
82/09	342	1.22	0.14	2.7	0.25	3.92	0.39
82/10	19	0.03	0.05	0.03	0.05	0.06	0.11
82/11	148	2.23	0.59	0.93	0.2	3.16	0.8
82/12	134	1.39	0.41	0.81	0.19	2.2	0.6
	9423	**107.4**	**0.45**	**80.03**	**0.27**	**187.42**	**0.72**
83/01	23	0.1	0.17	0.12	0.17	0.23	0.35
83/02	24	0.03	0.04	0.25	0.33	0.27	0.38
83/03	753	11.29	0.59	8.51	0.36	19.79	0.95
83/04	918	21	0.9	6.21	0.22	27.21	1.12
83/05	249	5.71	0.9	1.83	0.24	7.54	1.14
83/06	201	5.5	1.08	2.2	0.35	7.71	1.43
83/07	0	0	0	0	0	0	0
83/08	0	0	0	0	0	0	0
83/09	0	0	0	0	0	0	0
83/10	0	0	0	0	0	0	0
83/11	0	0	0	0	0	0	0
83/12	0	0	0	0	0	0	0
	2168	**43.63**	**0.79**	**19.12**	**0.28**	**62.75**	**1.07**
84/01	152	2.64	0.68	1.4	0.3	4.03	0.98
84/02	470	5.48	0.46	3.42	0.23	8.89	0.69
84/03	73	1.04	0.56	0.96	0.42	2	0.99
84/04	202	4.44	0.87	2.2	0.35	6.64	1.22
84/05	139	2.31	0.65	1.58	0.37	3.89	1.02
84/06	94	1.12	0.47	1.52	0.52	2.64	0.99
84/07	91	0.91	0.4	0.5	0.18	1.41	0.57
84/08	0	0	0	0	0	0	0
84/09	0	0	0	0	0	0	0
84/10	193	8.42	1.72	0.93	0.16	9.35	1.88
84/11	18	0.61	1.33	0.12	0.22	0.73	1.56
84/12	0	0	0	0	0	0	0
	1432	**26.97**	**0.74**	**12.63**	**0.28**	**39.58**	**1.02**
85/01	93	0.08	0.03	0.93	0.32	1.01	0.35
85/02	16	0.05	0.13	0.16	0.31	0.21	0.44
85/03	679	21.18	1.23	3.26	0.15	24.44	1.38
85/04	594	18.31	1.22	5.25	0.28	23.56	1.5
85/05	116	1.62	0.55	1.86	0.52	3.49	1.07
85/06	83	0.79	0.37	0.06	0.02	0.85	0.4
85/07	0	0	0	0	0	0	0
85/08	0	0	0	0	0	0	0
85/09	0	0	0	0	0	0	0
85/10	0	0	0	0	0	0	0
85/11	108	4.67	1.7	0.65	0.19	5.32	1.9
85/12	36	0.46	0.5	0.06	0.06	0.52	0.56
	1725	**47.16**	**1.08**	**12.23**	**0.23**	**59.4**	**1.31**

Table 1. Catch statistics for Japanese longline vessels fishing in the Philippine study area

Source of data : Fisheries Agency of Japan

Units : Catch - metric tonnes; CPUE - no. of fish per 100 hooks; TOTAL - Total Yellowfin and Bigeye

Month	100s of Hooks	YELLOWFIN Catch	YELLOWFIN CPUE	BIGEYE Catch	BIGEYE CPUE	TOTAL Catch	TOTAL CPUE
86/01	0	0	0	0	0	0	0
86/02	0	0	0	0	0	0	0
86/03	0	0	0	0	0	0	0
86/04	0	0	0	0	0	0	0
86/05	35	0.25	0.29	0.12	0.11	0.38	0.4
86/06	0	0	0	0	0	0	0
86/07	0	0	0	0	0	0	0
86/08	0	0	0	0	0	0	0
86/09	0	0	0	0	0	0	0
86/10	0	0	0	0	0	0	0
86/11	22	1.14	2.05	1.18	1.73	2.32	3.77
86/12	0	0	0	0	0	0	0
	57	**1.39**	**0.96**	**1.3**	**0.74**	**2.7**	**1.7**
87/01	0	0	0	0	0	0	0
87/02	73	0.25	0.14	1.46	0.64	1.71	0.78
87/03	169	7.38	1.72	1.24	0.24	8.62	1.96
87/04	269	4.11	0.6	3.51	0.42	7.62	1.02
87/05	98	0.86	0.35	2.76	0.91	3.63	1.26
87/06	146	0.99	0.27	2.52	0.55	3.5	0.82
87/07	49	0.91	0.73	0.87	0.57	1.78	1.31
87/08	0	0	0	0	0	0	0
87/09	0	0	0	0	0	0	0
87/10	49	0.43	0.35	1.61	1.06	2.05	1.41
87/11	0	0	0	0	0	0	0
87/12	0	0	0	0	0	0	0
	853	**14.93**	**0.69**	**13.97**	**0.53**	**28.91**	**1.22**
88/01	0	0	0	0	0	0	0
88/02	0	0	0	0	0	0	0
88/03	0	0	0	0	0	0	0
88/04	142	2.05	0.57	1.34	0.3	3.39	0.87
88/05	0	0	0	0	0	0	0
88/06	0	0	0	0	0	0	0
88/07	51	0.03	0.02	0.12	0.08	0.15	0.1
88/08	0	0	0	0	0	0	0
88/09	0	0	0	0	0	0	0
88/10	0	0	0	0	0	0	0
88/11	0	0	0	0	0	0	0
88/12	0	0	0	0	0	0	0
	193	**2.08**	**0.42**	**1.46**	**0.24**	**3.54**	**0.66**
89/01	0	0	0	0	0	0	0
89/02	0	0	0	0	0	0	0
89/03	0	0	0	0	0	0	0
89/04	508	4.26	0.33	18.41	1.17	22.67	1.5
89/05	0	0	0	0	0	0	0
89/06	0	0	0	0	0	0	0
89/07	0	0	0	0	0	0	0
89/08	0	0	0	0	0	0	0
89/09	49	0.58	0.47	0.68	0.45	1.27	0.92
89/10	0	0	0	0	0	0	0
89/11	0	0	0	0	0	0	0
89/12	0	0	0	0	0	0	0
	557	**4.84**	**0.34**	**19.09**	**1.1**	**23.94**	**1.44**

Table 1. Catch statistics for Japanese longline vessels fishing in the Philippine study area

Source of data : Fisheries Agency of Japan

Units : Catch - metric tonnes; CPUE - no. of fish per 100 hooks; TOTAL - Total Yellowfin and Bigeye

Month	100s of Hooks	YELLOWFIN Catch	YELLOWFIN CPUE	BIGEYE Catch	BIGEYE CPUE	TOTAL Catch	TOTAL CPUE
90/01	0	0	0	0	0	0	0
90/02	0	0	0	0	0	0	0
90/03	0	0	0	0	0	0	0
90/04	164	4.41	1.06	1.68	0.33	6.09	1.39
90/05	46	0.1	0.09	0.06	0.04	0.16	0.13
90/06	0	0	0	0	0	0	0
90/07	0	0	0	0	0	0	0
90/08	0	0	0	0	0	0	0
90/09	0	0	0	0	0	0	0
90/10	0	0	0	0	0	0	0
90/11	0	0	0	0	0	0	0
90/12	0	0	0	0	0	0	0
	210	**4.51**	**0.85**	**1.74**	**0.78**	**6.25**	**1.63**
91/01	270	3.04	0.44	14.35	1.71	17.39	2.16
91/02	0	0	0	0	0	0	0
91/03	110	3.93	1.41	0.12	0.04	4.06	1.45
91/04	0	0	0	0	0	0	0
91/05	0	0	0	0	0	0	0
91/06	0	0	0	0	0	0	0
91/07	51	0.81	0.63	2.24	1.41	3.05	2.04
91/08	25	0.15	0.24	0.37	0.48	0.52	0.72
91/09	331	3.5	0.42	4.6	0.45	8.1	0.86
91/10	119	0.63	0.21	0.37	0.1	1.01	0.31
91/11	0	0	0	0	0	0	0
91/12	0	0	0	0	0	0	0
	906	**12.06**	**0.53**	**22.05**	**0.78**	**34.13**	**1.31**
92/01	453	1.39	0.12	11.8	0.84	13.19	0.96
92/02	1187	4.64	0.15	30.52	0.83	35.16	0.98
92/03	3369	11.84	0.14	81.38	0.78	93.23	0.92
92/04	1028	21.25	0.82	15.84	0.5	37.09	1.31
92/05	296	14.35	1.91	7.23	0.79	21.59	2.7
92/06	0	0	0	0	0	0	0
92/07	0	0	0	0	0	0	0
92/08	0	0	0	0	0	0	0
92/09	0	0	0	0	0	0	0
92/10	153	0.81	0.21	0.93	0.2	1.74	0.41
92/11	212	0.74	0.14	2.17	0.33	2.91	0.47
92/12	0	0	0	0	0	0	0
	6698	**55.02**	**0.32**	**149.87**	**0.72**	**204.91**	**1.04**

Table 2

Catch statistics for longline vessels fishing in the Philippine study area (catch in metric tons)

Flag : KR

Year	Hundreds of Hooks	Skj_c	Yft_c	Alb_c	Bet_c	Bft_c	Mls_c	Bum_c	Blm_c	Swo_c	Sai_c	Shk_c	Oth_c
75	275		10.474		8.911			0.237		0.095			
77	716		1.014	6.807	20.865		0.154						
TOTALS	991	0.000	11.488	6.807	29.776	0.000	0.154	0.237	0.000	0.095	0.000	0.000	0.000

Flag : TW

Year	Hundreds of Hooks	Skj_c	Yft_c	Alb_c	Bet_c	Bft_c	Mls_c	Bum_c	Blm_c	Swo_c	Sai_c	Shk_c	Oth_c
74	1014		131.428							5.235			
78	2241		95.920		24.850			4.370		6.820		11.970	1.060
81	16		0.100	0.070	0.100								
TOTALS	3271	0.000	227.448	0.070	24.950	0.000	0.000	4.370	0.000	12.055	0.000	11.970	1.060

Table 2

Catch statistics for longline vessels fishing in the Philippine study area (catch in metric tons)

Flag : KR

Year	Hundreds of Hooks	Skj_c	Yft_c	Alb_c	Bet_c	Bft_c	Mls_c	Bum_c	Blm_c	Swo_c	Sai_c	Shk_c	Oth_c
75	275		10.474		8.911			0.237		0.095			
77	716		1.014	6.807	20.865		0.154						
TOTALS	991	0.000	11.488	6.807	29.776	0.000	0.154	0.237	0.000	0.095	0.000	0.000	0.000

Flag : TW

Year	Hundreds of Hooks	Skj_c	Yft_c	Alb_c	Bet_c	Bft_c	Mls_c	Bum_c	Blm_c	Swo_c	Sai_c	Shk_c	Oth_c
74	1014		131.428							5.235			
78	2241		95.920		24.850			4.370		6.820		11.970	1.060
81	16		0.100	0.070	0.100								
TOTALS	3271	0.000	227.448	0.070	24.950	0.000	0.000	4.370	0.000	12.055	0.000	11.970	1.060