SAILFISH (*Istiophorus platypterus*) FISHERIES OFF BRAZILIAN COAST BY NATIONAL AND LEASED LONGLINERS (1971-91)

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SUMMARY

The sailfish, Istiophorus platypterus, were caught all year round in the Brazilian coast during the period 1971-91. In area A (0°-10° S and 30°-40° W), it was caught mainly in the fourth quarter; in area B (10°-20° S and 30°-40° W) in the first; and in area C (20°-35° S and 40°-50° W) only in the fourth and first quarters. The highest quarterly CPUE was observed in area B in the first quarter (about 9 fish per 1,000 hooks); although fishing effort was very small in this area. Also, the quarterly CPUE in area C was highest (about 7 fish per 1,000 hooks) in the fourth quarter. The sailfish catches from the Santos fleet were very important from November to February, representing about 20% of the total longline yield. The Santos longline CPUE values for sailfish (October-February for two consecutive years) showed an increasing trend from 1971/72 to 1976/77 and a decreasing trend through 1983/84; CPUE's increased again in 1987/88. Every year sailfish spawn from November to February in the South and Southeast of Brazil (20°-27° S and 39°-48° W). The average dressed weight in area C (36 kg) was about 20 kg higher than in area A (16 kg).

RESUME

Le voilier, Istiophorus platypterus, a été capturé tout au long de l'année sur les côtes brésiliennes pendant la période 1971-91. Dans la zone A (0°-10°S et 30°-40°W), il a surtout été capturé pendant le quatrième trimestre; dans la zone B (10°-20°S et 30°-40°W) pendant le premier trimestre; et dans la zone C (20°-35°S et 40°-50°W) seulement pendant les quatrième et premier trimestres. La CPUE trimestrielle la plus élevée a été observée dans la zone B pendant le premier trimestre (9 poissons environ par millier d'hameçons), bien que l'effort de pêche ait été très réduit dans ce secteur. Par ailleurs, la CPUE trimestrielle de la zone C a montré sa valeur la plus élevée (7 poissons environ par millier d'hameçons) pendant le quatrième trimestre. Les prises de voilier de la flottille de Santos étaient très importantes de novembre à février, et constituaient environ 20 % de la production palangrière totale. Les valeurs de la CPUE palangrière de Santos pour le voilier (octobre-février pour deux années consécutives) ont montré une tendance croissante de 1971-72 à 1976-77, et une tendance décroissante jusqu'en 1983-84; la CPUE s'est accrue de nouveau en 1987-88. Chaque année, le voilier fraie de novembre à février au sud et au sud-est du Brésil (20°-27°S et 39°-48°W). Le poids manipulé moyen de cette zone (36 kg) dépassait d'environ 20 kg celui de la zone A (16 kg).

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RESUMEN

El pez vela (Istiophorus platypterus) se pescó durante todo el año en la costa brasileña, en el período 1971-91. En la zona A (0°-10° S y 30°-40° W) se capturó sobre todo en el cuarto trimestre; en la zona B (10°-20° S y 30°-40° W) en el primero y en la zona C (20°-35° S y 40°-50° W) sólo en los trimestres primero y cuarto. La CPUE trimestral mas alta se observó en la zona B durante el primer trimestre (alrededor de 9 peces por 1.000 anzuelos), si bien, el esfuerzo de pesca allí fue muy escaso. Así mismo, la CPUE trimestral en la zona C fue la mas alta (alrededor de 7 peces por 1.000 anzuelos) durante el cuarto trimestre. Las capturas de pez vela de la flota de Santos fueron muy importantes entre los meses de noviembre y febrero, representando alrededor del 20% del rendimiento total del palangre. Las cifras de CPUE del palangre de Santos sobre el pez vela, (octubre-febrero en dos años consecutivos) mostraban una tendencia al alza de 1971-72 hasta 1976-77 y una tendencia a la baja hasta finales del período 1983-84; la CPUE aumentó de nuevo en 1977-88. Todos los años, el pez vela efectúa el desove entre los meses de noviembre y febrero, en el sur y sudeste de Brasil (20°-27° S y 39°-48° W). El peso medio eviscerado en la zona C (36 kg) era superior al de la zona A (16 kg) en unos 20 kg.

1. INTRODUCTION

Sailfish are circumtropical, occurring in all warm waters of the world. In the Atlantic Ocean, sailfish, *Istiophorus platypterus* or *I. albicans* or *I. americanus* (synonyms), are most densely distributed in waters close to land masses in tropical and subtropical areas (Ueyanagi et al., 1970). In the Atlantic, the distribution ranges from latitude 30° S to 30°N on the western side with only occasional stragglers beyond these limits (Beardsley, Merrett and Richards, 1975).

Sailfish occur along the coast of South America all year long. Their migratory movements, however, are not clear (Wise and Davis, 1973).

In this paper, the authors analyze the longliners fishery off the Brazilian coast. A comparison of catches among all longline fleets based in Natal city (Rio Grande do Norte State), in Santos city (São Paulo State) and in Rio Grande city (Rio Grande do Sul State) was made including fishing effort, yield, CPUE and average weight.

2. MATERIAL AND METHODS

The methodology used in this paper follows the same as those reported in: Amorim and Arfelli (1984, 1987); Amorim, Arfelli and Galhardo-Amado (1985); Antero-Silva (1982, 1986); Arfelli and Amorim (1981); Arfelli, Amorim and Galhardo-Amado (1986); Hazin et al. (1990) and Hazin et al. (SCRS/92/30).

The data utilized in this study were obtained from Brazilian longliners based in Natal, Santos, Rio Grande and the leased Japanese longliners from Rio Grande. From Santos, the data is from commercial log sheets, and the others are from Captains logbooks.

The leased Japanese longliners fished in entire coast of Brazil at 10° 29' N to 45° 55' S (Antero-Silva, SCRS/92/33). The fleet from Santos fished from 20°-33° S and 39°-50° W. Since the beginning of the period, the longliners from Santos have fished the areas according to the season. From the beginning of May to the middle of October, they fished South of parallel 27° and during the rest of the year North of 27° (Arfelli and Amorim, 1981). However, since 1979 the fishing areas by season have changed somewhat and boats occasionally fished in an area not normally used for that season (Arfelli and Amorim, 1985). From 1985 to the present, boats operated in every part of the area 20°-33° S and 39°-50° W. The fishing area of the fleet from Natal was at 7° N - 17° S and 24°-27° W (Hazin et al. SCRS/92/30).

The fishing effort is reported in number of hooks set by quarter and year. The yield is in number of fish and the catch per unit effort (CPUE) is in number of fish per 1,000 hooks, both presented year

and quarter. The data from Santos longliners are presented by month. The annual average weight is presented in dressed weight (gilled, gutted and without bill and tip of caudal fin).

In order to facilitate the analysis, three different areas off the Brazilian coast were created: area A (0°-10° S to 30°-40° W), area B (10°-20° S to 30°-40° W) and area C (20°-35° S to 40°-50° W) (Figure 1 from SCRS/92/51).

The percent of sailfish catch was based in the total weight related to the catch of all species.

The monthly yield and CPUE from the Santos fleet were presented by sailfish season, from October to February (occasionally in September and March) of two consecutive years, from 1971/72 to 1986/87.

3. RESULTS

The distribution of fishing effort is shown in Figures 2, 3, 4 and 5 of Antero-Silva et al. (I-CCAT/SCRS/92/51). The leased Japanese longliners operated in almost all the South Atlantic, from international waters off Argentina (42° 55' S), to equatorial waters (10° 29' N). They operated in the Brazilian coast mainly in area C during cold periods (April to September). In the hottest months (October to March), the fleet directed their activities to the equatorial region, fishing in the Northeast of Brazil and near "Ascencão" Island, including waters near Africa. During the period 1977-91, the Japanese longliners set about 24,000,000 hooks in the whole Atlantic Ocean as follows: 81% (19,400,000 hooks) set in area C; 9.8% (2,300,000 hooks) set in area A; and 9% (2.2 million hooks) set in area B, according to Antero-Silva (SCRS/92/33). The Brazilian fleet from Natal set about 2,300,000 hooks in the period 1983/91.

The fleet from Santos, operating only in area C, set 27,000,000 hooks as follows: about 19% in the first quarter, 25% in the second, 27% in the third and 29% in the fourth. The annual fishing effort from Santos longliners has shown an increasing trend from 1971 through 1985, ranging from 400,000 hooks in 1972 to 2,800,000 hooks set in 1990.

The national fleet of Rio Grande set 1,200,000 hooks in area C. In the Southwestern Atlantic, the most important fishing grounds for sailfish was off South and Southeast of Brazil (area C). In addition, area B (Eastern location) also had a small amount of fishing effort.

Every year, sailfish migrate South to Southeast of Brazil, in order to spawn between the latitudes 20° and 27° S, and longitudes 39° and 48° W. Sailfish usually appear from October to March; but occasionally in September (Arfelli and Amorim, 1981). During this period, the monthly catches from November to January were (in weight) about 14%, 27% and 10% of the total catches, respectively. The historical data base from Santos longliners indicate a cumulative catch of about 19,000 sailfish in the first quarter and 49,000 in the fourth.

The Japanese longliners fished in the Southern area during autumn and winter; a period when sailfish are not abundant. Also, in spring and summer this fleet directed the activities to the equatorial region and there, sailfish catches are very small (Figure 1) because it appears that sailfish concentrate in the South and Southeast in the summer time. Also, sailfish are very abundant at this time in the Eastern area (Figure 1).

Figure 2 shows the annual yield from Japanese, Santos, Natal and Rio Grande longline fleets. Only the Santos longliners showed high catches of sailfish, particularly in 1986 (about 12,000 fish). The yield values indicated the peak occurred in 1986, with 243 fish in area A and B. The yield in area C are ten times higher, with a maximum of 11,000 fish in 1986.

Figure 3 shows the annual CPUE in the three different areas. The highest CPUE was in area B, although these catches were occasional. Also, area C showed a sailfish CPUE with a slight decreasing trend.

The quarterly CPUE by the Japanese fleet in the area A did not show any fluctuations (Figure 4). The main concentration of sailfish in area C, with about 9 fish per 1,000 hooks, was in the first (20°-25° S and 35°-45° W) and fourth quarters (25°-30° S and 45°-50° W) by Santos longliners. Figure 5 shows the quarterly CPUE of areas A, B and C by the different fleets. In area A, sailfish were caught in small numbers in the fourth quarter. Area B was an important fishing ground for sailfish in the first and fourth quarters, although the fishing effort was very small. In area C, sailfish were caught mainly in the fourth and first quarters and they disappeared in the second and third quarters. The seasonal distribution of the Brazilian and Japanese fleet from Rio Grande showed the same fluctuation as the CPUE of the Santos fleet. In areas B and C, the fourth and first quarters had remarkably large catches of sailfish from the sport fishing fleet during tournaments. This information was reported by Paiva and Pires, Jr. (1983) and Jorge et al. (In press).

Sailfish average weight (36 kg) from area C was about 20 kg higher than the average from area A, which is 16 kg (Figure 6). The Figures 7 and 8 show the monthly yield and CPUE of sailfish caught by Santos longliners. These data showed a distinct seasonality and demonstrate the necessity for analysis by season. Sailfish first arrive in September/October and depart in March of the next year. The highest CPUE for the whole period (39 fish per 1,000 hooks) occurred in November of 1986. The lowest value of CPUE occurred in the beginning or the end of the season (September/October and March, respectively). Some specimens are occasionally caught during other seasons. According to Figure 8, a decreasing trend in CPUE was not observed in the period 1971 through 1987.

Wise and Davis (1973) analyzed the fishery of Japanese longliners in the whole Atlantic Ocean from 1956 to 1968 and presented the annual CPUE ranging from 2 to 6 fish (per 1,000 hooks). When we compared these data to information from this report (1971 to 1991), there was a general reduction in the CPUE. In areas B and C, during the first and fourth quarters, the CPUE from this paper were higher than those reported by Wise and Davis (1973). Nevertheless, the quarterly distribution of sailfish CPUE remains almost the same.

The observed trends in CPUE per area and period might be attributed to some longliners avoiding the catch of this species, due to its low price in the market.

4. CONCLUSIONS

The sailfish catches made by the leased Japanese fleet were considered secondary. Occasionally, Brazilian longliners from Santos directed their fishing activities towards sailfish, however, the main target species were usually tunas and swordfish.

Sailfish show migratory movements in the South and Southeast of Brazil, with high catches in the fourth and first quarters, but minimal catches in the rest of the period.

Based on the CPUE data, area C and possibly area B (in the fourth and first quarters, respectively) are the most important fishing grounds for sailfish.

The quarterly CPUE distribution of sailfish did not change from 1956/68 to 1971/91, only a slight reduction was verified in these values.

Sailfish usually spawn in area C (20°-27° S and 39°-48° W from October to March) concentrating in large numbers during warmest season.

5. LITERATURE CITED

AMORIM, A. F. and C. A. ARFELLI. 1984. Estudo biológico-pesqueiro do espadarte, *Xiphias gladius* Linnaeus, 1758, no Sudeste e Sul do Brasil, (1971 a 1981). B. Inst. Pesca, São Paulo, v.11 (único):35-62.

AMORIM, A. F. and C. A. ARFELLI. 1987. Analysis on *Makaira nigricans* Lacépedh, 1802, caught off South and Southeast of Brazil (1971-1985). Collective Volume of Scientific Papers, ICCAT, Madrid, 26 (2):409-25.

AMORIM, A. F., C. A. ARFELLI, and J. C. GALHARDO-AMADO. 1985. Catch per unit effort of Xiphiidae and Istiophoridae from Brazilian longliners (1971-82). Collective Volume of Scientific Papers, ICCAT, Madrid, 23 (2):337-41.

ANTERO-SILVA, J. N. 1982. Acompanhamento da pesca de atuns e afins por espinheleiros japoneses arrendados por indústria brasileira em 1981. PDP/SUDEPE Informe Técnico n° 1 Rio Grande:1-17.

ANTERO-SILVA, J. N. 1986. A pesca de atuns no Brasil com espinhel por barcos japoneses arrendados. PDP/SUDEPE Informe Técnico, Rio Grande:1-14.

ANTERO-SILVA, J. N. *In press*. The tuna fishery in Brazil by leased Japanese longliner fleet from 1977 to 1991. ICCAT/SCRS/92/33.

ANTERO-SILVA, J. N., A. F. AMORIM, R. P. T. LESSA, F. H. V. HAZIN and C. A. ARFELLI. *In* press. White marlin (*Tetrapturus albidus*) fisheries off Brazilian coast from national and leased longliner fleet. ICCAT/SCRS/92/51.

ARFELLI, C. A. and A. F. AMORIM. 1981. Estudo biológico-pesqueiro do agulháo-vela, *Istiophorus platypterus* (Shaw and Nodder, 1791), no sudeste e sul do Brasil (1971 a 1980). B. Inst. Pesca, Sáo Paulo, 1981 8 (único):9-22.

ARFELLI, C. A. and A. F. AMORIM. 1985. Analysis on *Xiphias gladius* L. caught off South and Southeast of Brazil (1971-1981). Collective Volume of Scientific Papers, ICCAT, Madrid, 23 (2):319-32.

ARFELLI, C. A., A. F. AMORIM and J. C. GALHARDO-AMADO. 1986. Analysis on *Tetrapturus albidus* Poey (1861), caught off South and Southeast of Brazil (1971-1984). Collective Volume of Scientific Papers, ICCAT, Madrid, 25: 202-17.

BEARDSLEY, JR., G. L., N. R. MERRETT and W. J. RICHARDS. 1975. Synopsis of the biology of sailfish, *Istiophorus platypterus* (Shaw and Nodder, 1791). *In*: International Billfish Symposium, 9-12 Aug., Kailua-Kona, Hawaii, 1972. Proceedings... part 3: Species Synopses, Seattle, WA, Jun (NOAA Technical Report NMFS-SSRF, 675).

JORGE, L. A., L. M. REIS, L. J. SIK, L. R. MELO and T. L. JORGE. *In press*. Informacões preliminares sobre a pesca do Estado do Espirito Santo, IBAMA, Espirito Santos.

HAZIN, F. H. V., A. A. COUTO, K. KIHARA, K. OTSUKA and M. ISHINO. 1990. Distribution and abundance of pelagic sharks in the Southwestern equatorial Atlantic. Journal of the Tokyo University of Fisheries, n. 7791, :51-64.

HAZIN, F. H. V., R. P. T. LESSA, R. R. ARRAES, M. R. COIMBRA, R. S. SOUZA, M. NATALINO and P. S. PANTOJA. *In press*. Distribution and relative abundance of tunas and billfishes in the Southwestern Equatorial Atlantic. ICCAT/SCRS/92/30.

PAIVA, M. P. and O. C. PIRES-JUNIOR. 1983. Temporadas de pesca esportiva e oceánica, ao longo do Estado do Rio de Janeiro (Brasil). Boletim de Ciéncias do Mar, LABOMAR, 38:1-12.

UEYANAGI, S., S. KIKAWA, M. UTO and Y. NISHIKAWA. 1970. Distribution, spawning, and relative abundance of billfishes in the Atlantic Ocean. Bull. Far Seas Fish. Res. Lab., Shimuzu, (3):15-55. Original Japanese, English summary.

WISE, J. P. and C. W. DAVIS. 1975. Seasonal distribution of tunas and billfish in the Atlantic. NOAA Technical Report NMFS-SSRF, Seattle, WA. (662) 1-24, Jan.

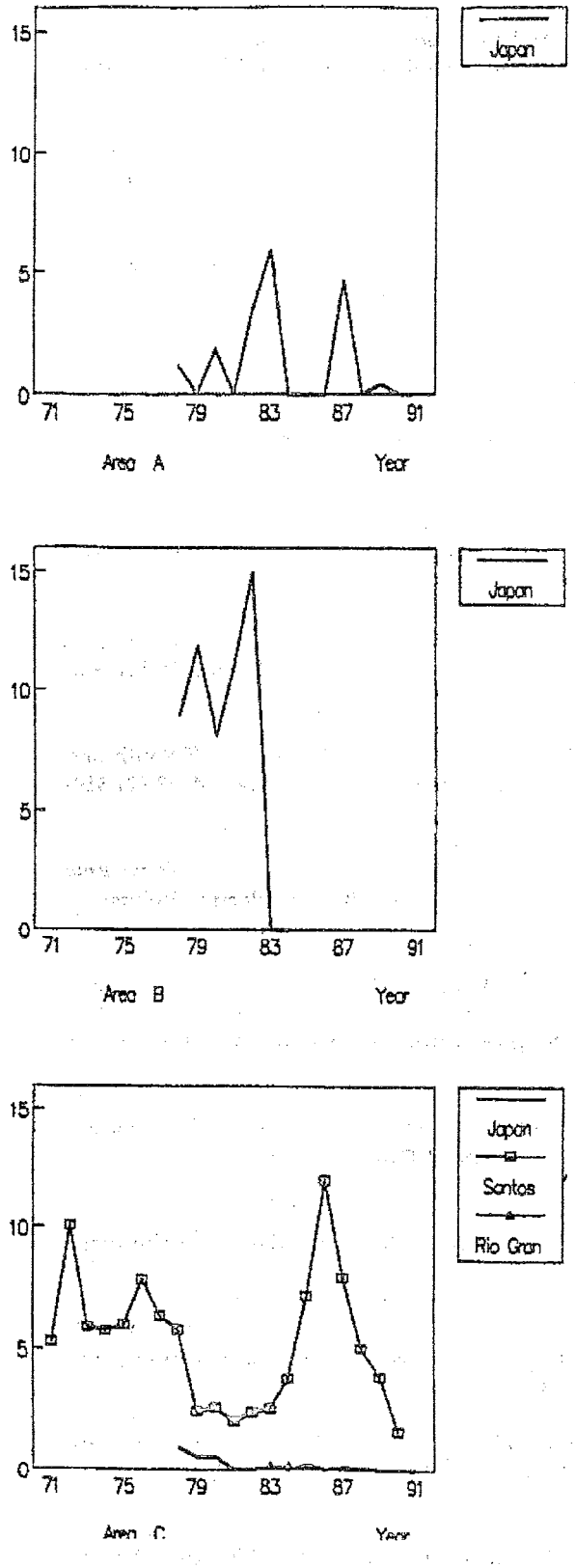


Figure 1. Percentage of total sailfish catch of leased Japanese, Santos and Rio Grande longliner fleets from areas A, B, and C.

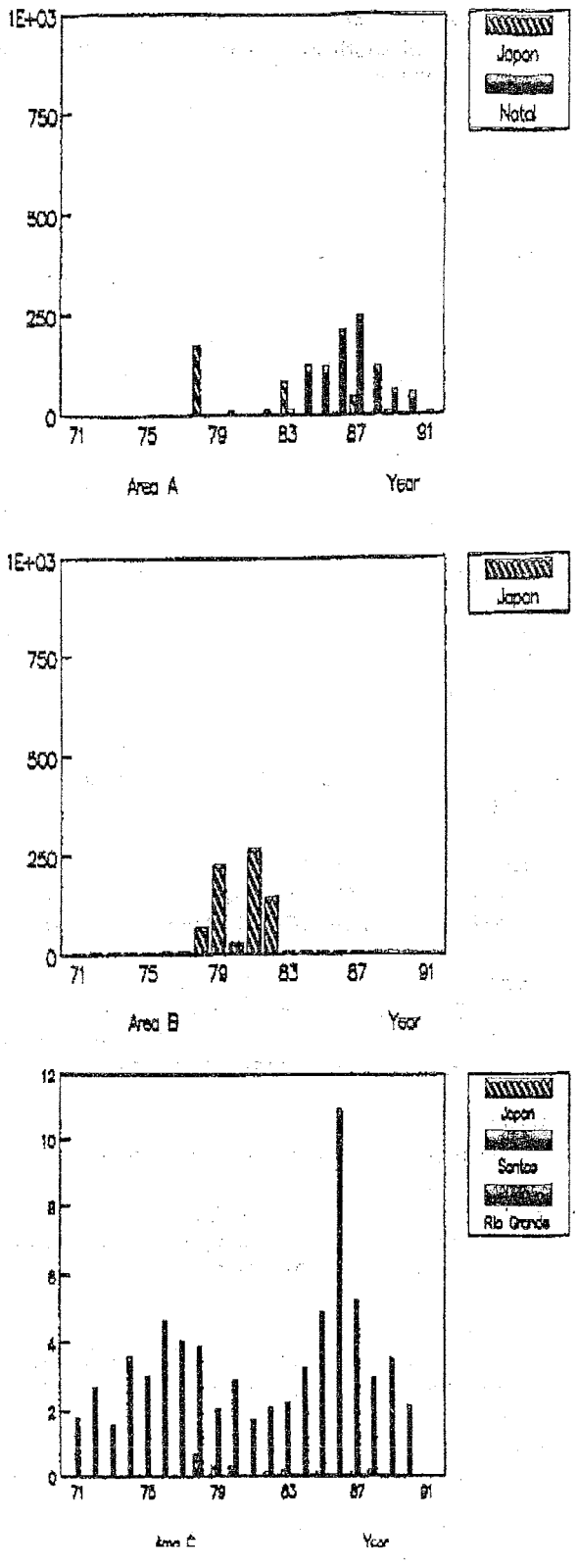


Figure 2. Annual sailfish yield (in thousand fish) of Japanese, Natal, Santos, and Rio Grande longliner fleets from areas A, B, and C.

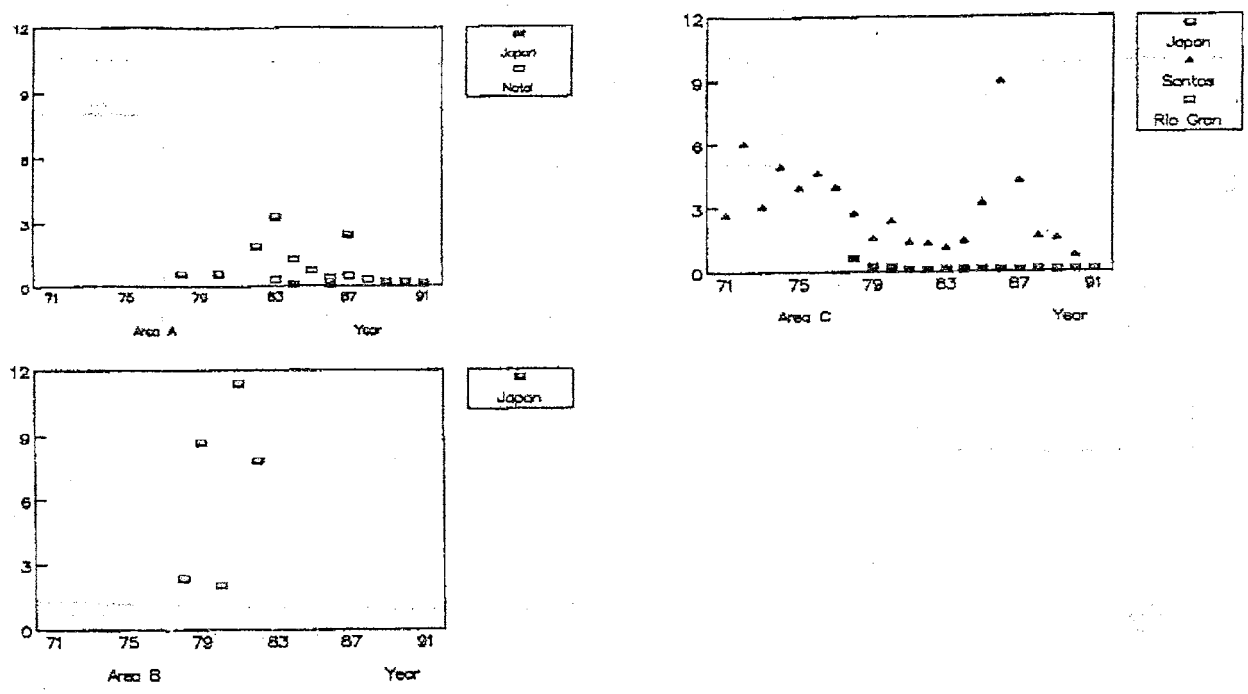


Figure 3. Annual sailfish CPUE of Japanese, Natal, Santos, and Rio Grande longliner fleets from areas A, B, and C.

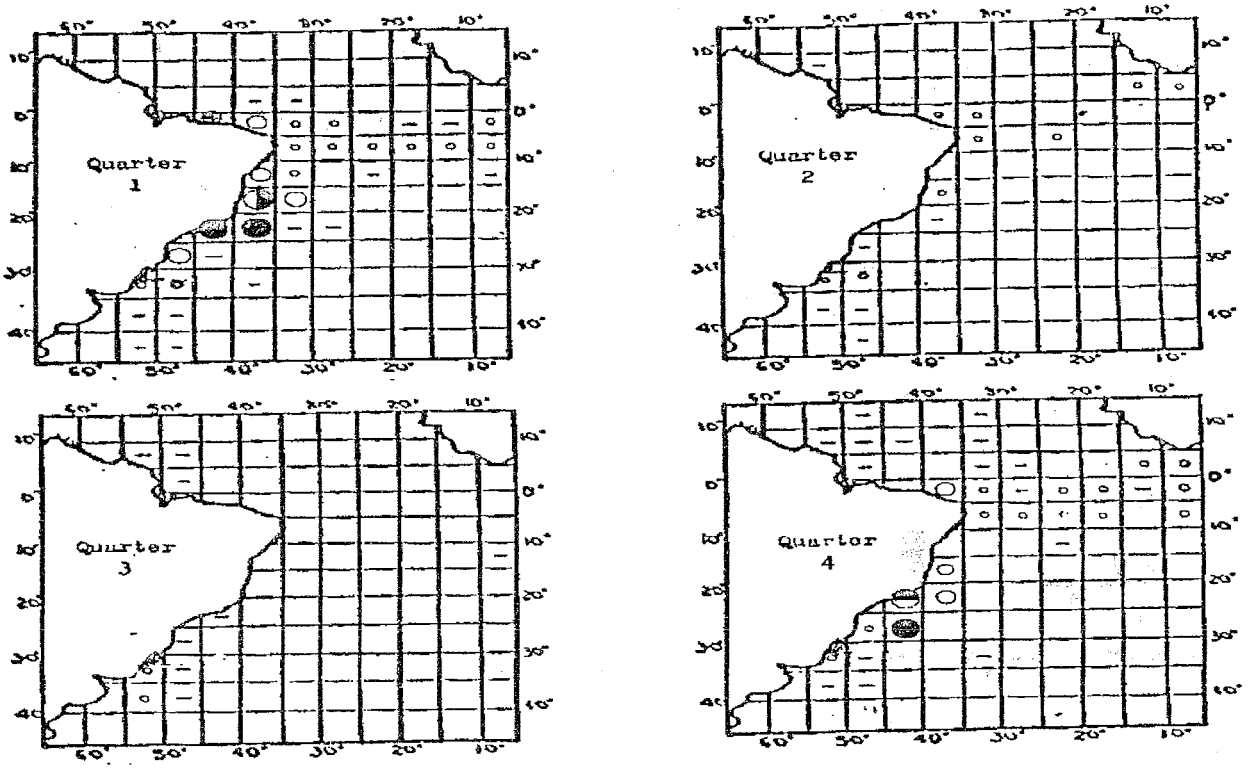


Figure 4. Quarterly distribution of sailfish CPUE from leased Japanese longliners in the Atlantic Ocean.

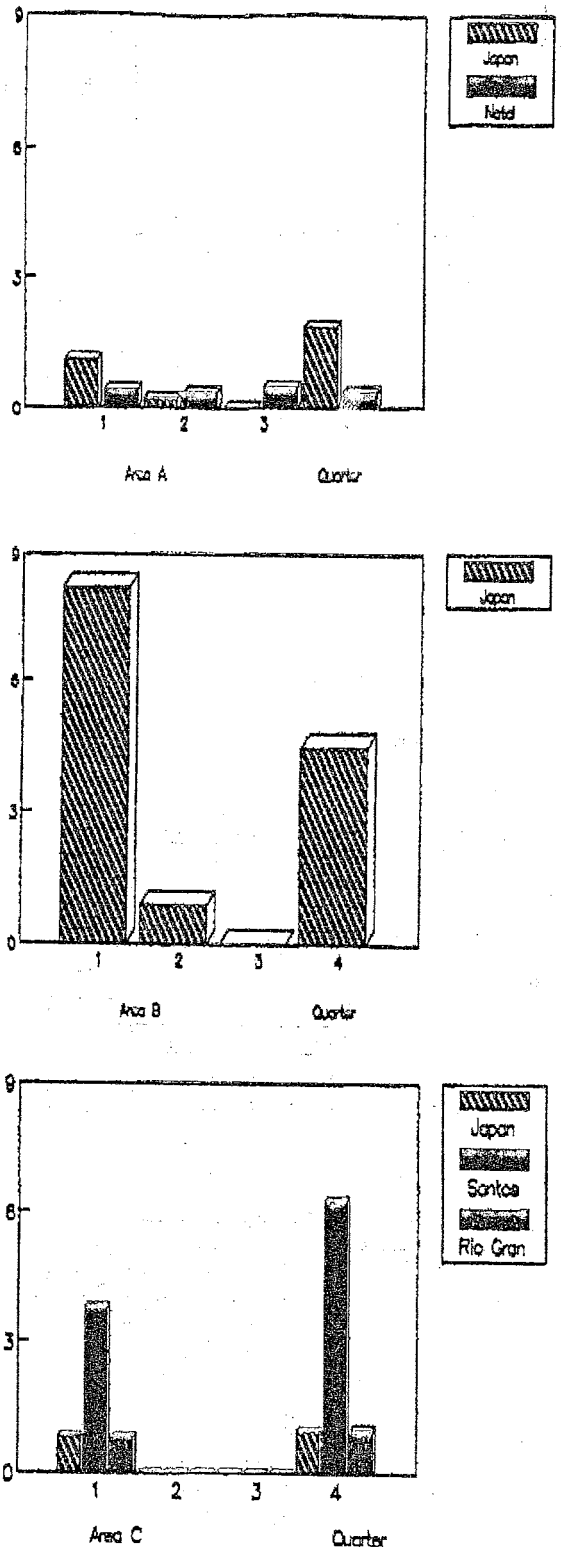


Figure 5. Quarterly sailfish CPUE by Japanese, Natal, Santos, and Rio Grande longline fleets in the areas A, B, amd C.

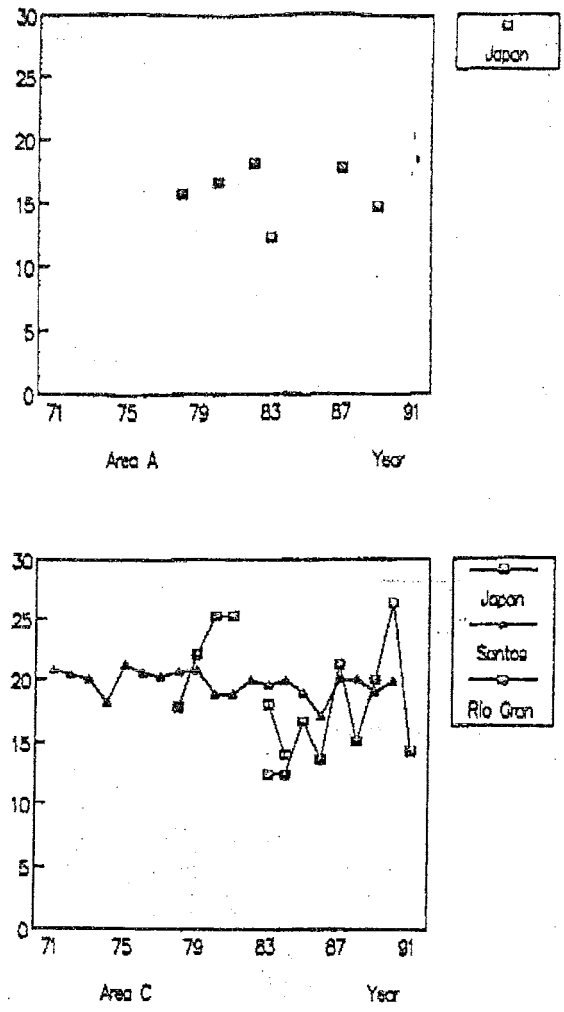
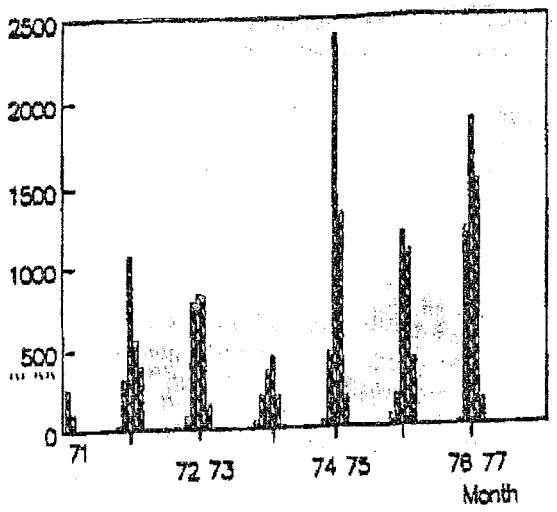
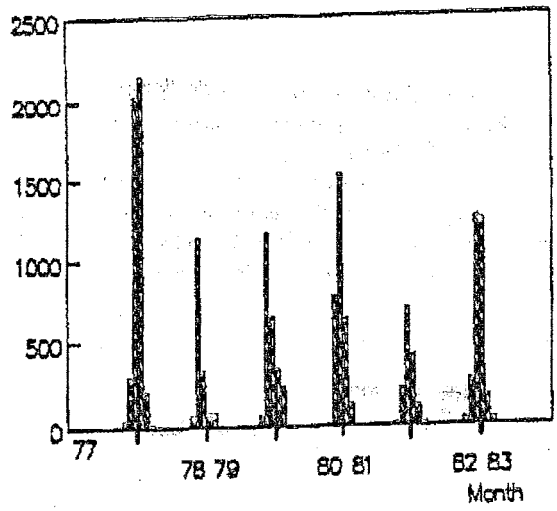


Figure 6. Annual average weight of sailfish taken by Japanese, Santos, and Rio Grande longline fleets in the areas A and C.





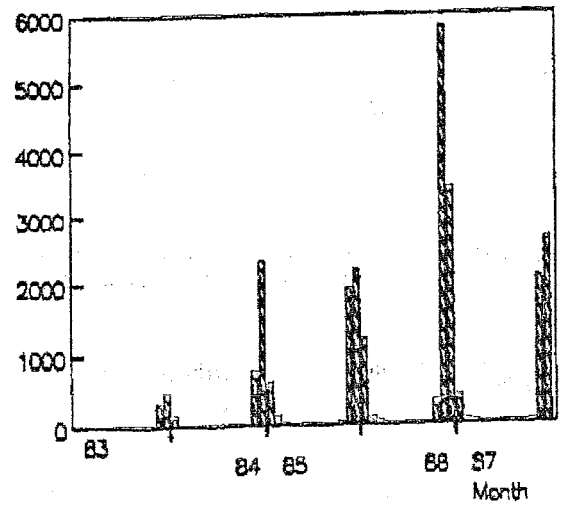
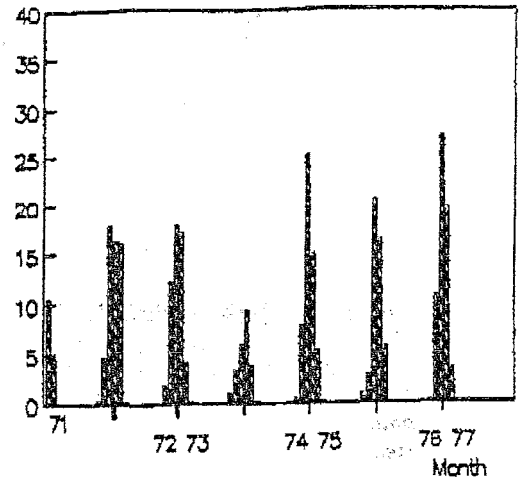
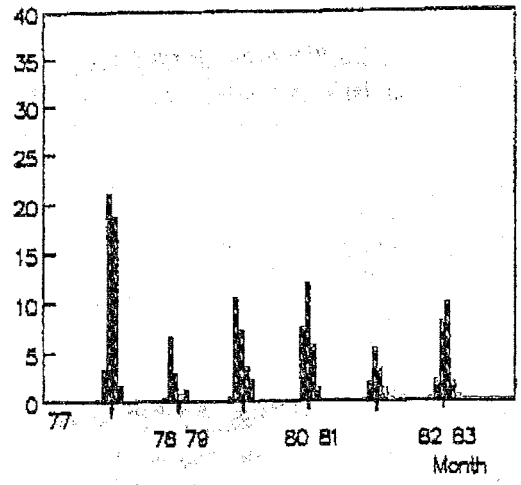


Figure 7. Monthly catch (in number of fish) of sailfish, by Santos longline fleet in the area C.





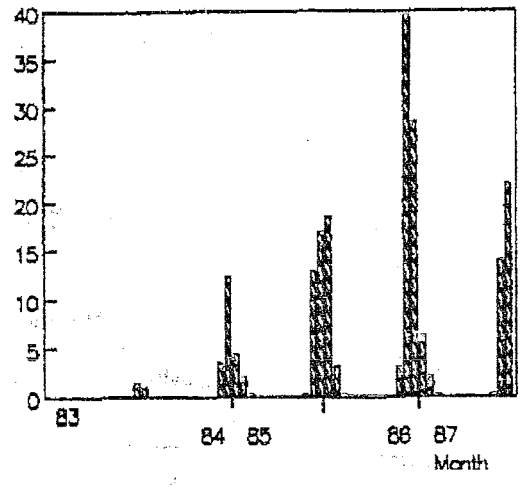


Figure 8. Monthly CPUE of sailfish by Santos longline fleet in the area C.