A DESCRIPTION OF THE BAITBOAT FISHERY OFF THE SOUTH AND SOUTHEAST BRAZIL

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SUMMARY

A description of the Brazilian baitboat fishery in the South Atlantic is presented. The fishery started in 1979, in Rio de Janeiro (southeast Brazil), and developed rapidly, reaching 92 vessels in 1982. In the following years the number of vessels declined to around 50 units. The baitboat fleet was composed of Brazilian and foreign flagged leased baitboats, which were nationalized and incorporated into the Brazilian fleet, in 1992. Three Portuguese flagged leased baitboats operated in the fishery from 1995 to 1997. Skipjack (Katsuwonus pelamis) has been the target species contributing 89% of the catch, with yellowfin (Thunnus albacares) appearing as the second most important species. Skipjack catches increased sharply during the first years of the development of the fishery and reached a peak record of 25,051 MT in 1985, which was surpassed only in 1997 (25,573 MT). Catches show high seasonable variability reaching high levels during the summer with the lowest catches occurring in the winter. Important changes have occurred in the fishery such as the expansion of the fishing area, increase in vessel characteristics and a concentration of fishing operations in the southern region of Brazil. The distribution of catch and effort is presented, as well as CPUE trends and differences in fishing performance between fleets. The length-frequency distribution of skipjack is unimodal, with fish between 48 and 62 cm dominating the catches. Annual mean lengths varied from 54.7 cm to 58.9 cm and there is no indication of reduction in fish size.

RÉSUMÉ

Le présent document décrit la pêche des canneurs brésiliens dans l'Atlantique Sud. Cette pêche a démarré à Rio de Janeiro en 1979 (dans le sud-est du Brésil), puis s'est rapidement développée, et comptait 92 unités en 1982. Le nombre des bateaux a diminué les années suivantes à 50 unités environ. La flottille de canneurs se composait de bateaux brésiliens et de bateaux à pavillon étranger en location, qui avaient été nationalisés et incorporés à la flottille brésilienne en 1992. Trois canneurs en location battant pavillon portugais ont pris part à la pêche de 1995 à 1997. Le listao (Katsuwonus pelamis) était l'espèce-cible, et représentait 89 % de la capture, suivi de l'albacore (Thunnus albacares). Les prises de listao se sont brusquement accrues pendant les premières années de la pêcherie, et ont atteint un chiffre record de 25.051 TM en 1985, qui n'a été dépassé qu'en 1997 (27.573 TM). Les prises montrent une forte variabilité saisonnière; elles sont à leur maximum pendant la saison d'été et montrent leur niveau le plus faible en hiver. La pêcherie a subi des changements importants, tels que

l'expansion de la zone de pêche, l'amélioration des caractéristiques des bateaux et la concentration de la pêche au sud du Brésil. Ce document présente la distribution de la prise et de l'effort, ainsi que la tendance de la CPUE et les différences entre flottilles quant à une pêche performante. La distribution des fréquences de taille du listao est unimodale; les poissons de 48 à 62 cm prédominent dans la prise. La taille annuelle moyenne a varié de 54,7 à 58,9 cm, et il n'y a pas de signes d'une réduction de la taille du poisson.

RESUMEN

Se describe la pesquería brasileña de barcos de cebo en el Atlántico sur. La pesquería se inició en 1979 en Rio de Janeiro (sudeste de Brasil) y experimentó un rápido desarrollo, llegando a 92 barcos en 1982. En los años posteriores, el número de barcos disminuyó hasta cerca de 50 unidades. La flota de barcos de cebo se componía de barcos brasileños y de barcos alquilados de bandera extranjera que se nacionalizaron e incorporaron a la flota brasileña en 1992. Tres barcos de cebo alquilados, de bandera portuguesa, operaron en la pesquería de 1995 a 1997. La especie objetivo era el listado (Katsuwonus pelamis) que constituía el 89% de la captura, con el rabil (Thunnus albacares) como segunda especie en importancia. Las capturas de listado aumentaron mucho en los primeros años del desarrollo de la pesquería, alcanzando una cifra récord de 25.051 t. en 1985, sólo superada en 1997 (25.573 t). Las captura muestran una gran variabilidad según las estaciones, con los niveles mas altos en el verano y los mas bajos en el invierno. En la pesquería se han producido importantes cambios, tales como la expansión de la zona de pesca, aumento en las características de los barcos y concentración de las operaciones pesqueras en la zona sur de Brasil. Se presenta, la distribución de la captura y esfuerzo, así como las tendencias de la CPUE y las diferencias en las operaciones pesqueras entre flotas. La distribución de las frecuencias de talla del listado es unimodal, predominando en las capturas los peces entre 48 y 62 cm. Las tallas medias anuales estaban entre 54.7 y 58.9 cm y no hay indicios de reducción en la talla de los peces.

1. INTRODUCTION

Skipjack tuna (*Katsuwonus pelamis*) in the Atlantic Ocean is caught almost exclusively by purse seiners and baitboats, with a minor proportion of the catches being taken as by-catch by longline fisheries.

In the east Atlantic skipjack is caught mainly by purse seiners, whose catches represent more than 2/3 of the total catch in weight, whereas in the west Atlantic major catches are taken by baitboats. Another important difference between the fisheries developed in each side of the Atlantic is that in the eastern Atlantic there is no direct skipjack fisheries and catches of this species are taken together with yellowfin and bigeye tuna, which are the main target species. As for the western Atlantic, the most important fishery is the Brazilian baitboat fishery in which skipjack is the main target species.

For stock assessment purposes the SCRS has considered the existence of two stocks of skipjack in the Atlantic Ocean, separated by the longitude of 30^{o} W (ICCAT, 1998). The existence of two management units is largely supported by results of tagging experiments carried out in the beginning

of the eighties, as part of the International Skipjack Year Program, conducted by ICCAT during 1979 through 1982. At that time, the absence of transatlantic recoveries of skipjack tagged in the east Atlantic was accepted as a scientific base to support the assumption of two management units of skipjack in the Atlantic Ocean (Anon. 1986).

Although it has been argued that the amount of tagged fish in the east Atlantic could not be enough to allow for tag returns to occur in catches of the Brazilian baitboat fishery, that were in a stage of early development in the west Atlantic, up to now there is little evidence for the assumption of a single stock unit of skipjack in the Atlantic Ocean.

The assumption of one stock in the eastern Atlantic and another stock in the western Atlantic is also supported by the distribution of the species, which appears to be discontinuous from off eastern Brazil to off western African countries and by the existence of two different fisheries in each side of the Atlantic, which appears to show considerable differences in trends of catches and size composition.

Since 1974 the possibility of development of surface tuna fisheries in Brazilian waters had been pointed out by Zavala-Camin (1974, 1978), based on observations of frequent sights of surface tuna schools during observer trips on board of tuna longliners, in the south and southeast regions of Brazil. However, it was only in 1978 that the Brazilian baitboat fishery was initiated.

Fishermen from Cape Verde, which have migrated to Brazil, were the first to develop experiments of fishing with pole and line targeting surface tuna schools in Brazilian waters. These experiments were carried out using a small purse seine vessel from the sardine fishery that was adapted to operate as baitboat. The results showed the viability of the fishery by this fishing method using the same vessels from other coastal Brazilian fisheries, which needed only small adaptations to operate in this new fishery. The success of this experiment attracted the interest of Brazilian fishermen and, in 1979, 7 vessels from other fisheries were modified to operate in the baitboat fishery.

In 1981, some baitboats started to develop fishing for skipjack from the port of Itajai (Santa Catarina state), in the south region of Brazil, mainly during the summer months, with their operations concentrating in the south limit of the fishing area exploited by baitboats based at Rio de Janeiro. By the end of 1981, fishing operations by large size Japanese flagged baitboats, leased by Brazilian companies, were also initiated in Santa Catarina.

On the basis of information that high skipjack catch rates were obtained from fishing operations developed by the leased baitboats in the south region of Brazil, specially during the summer months, the Brazilian fleet expanded its fishing operations towards the South, concentrating its fishing effort in this more productive fishing area during the summer by the end of 1983.

In this paper a descriptive analysis of the baitboat fishery off the south and southeast Brazil is presented, showing changes in vessel characteristics and in distribution of catch and fishing effort over the years 1980 through 1998 and stressing the differences in fishing performance between Brazilian and foreign flagged leased baitboats. It is hoped that this information will *be* useful for a better understanding of basic catch and effort data needed for stock assessment analysis of the western skipjack stock.

2. MATERIAL AND METHODS

The basic data used in the analysis was obtained from the Statistical Data System of IBAMA for collection of information from the baitboat fishery off the South and Southeast coast of Brazil. Two sources of data were used; the first was composed of log book data that were available either as

individual records of fishing trips, aggregated by month and one degree statistical block, or as individual records of the fishing activities conducted each day during a fishing trip. In both cases the information provided in log books comprised: vessel activity (days fishing bait, days spent at sea moving to the fishing ground or facing bad weather conditions, searching days and effective fishing days), daily information on position (latitude and longitude), sea surface temperature (^{o}C) and the estimated weight of each species caught. The other source of data consisted of total weight of landed catch by species for each fishing trip and information on the main vessel characteristics: gross registered tonnage (GRT), total length, age of the vessels and carrying capacity.

Fishing effort derived from vessel activity was considered as the sum of searching days and effective fishing days. All catch and effort data were aggregated by month and 1^{o} x 1^{o} area and the aggregated skipjack catch data, was raised to the nominal landed catch to show the geographical distribution of average skipjack catches on a quarterly basis.

Fishing effort by month and 1^{o} x 1^{o} area was grouped into three time periods: I (from 1983 to 1985), which corresponds to first development of the fishery and was marked by the expansion of the fishing area towards south and by a reduction in fleet size due to small sized vessels being withdrawn from the fishery: II (1986 to 1992) which was characterized by an increasing concentration of landings in Itajai (Santa Catarina) and the entrance of new vessels in the fishery; and III (from 1993 to the present), which was initiated with the incorporation of the large size leased baitboats to the Brazilian fleet, which have since then transferred their operation base to the Port of Rio Grande (Rio Grande do Sul state), where landings of these vessels used to occur only sporadically, during the summer months.

For each segment of the baitboat fleet the geographical distribution of fishing effort within the total fishing area (20^{o} S to 35^{o} S) was analysed considering a sub-division of the total area in 3 sub areas: sub-area I (20^{o} S - 24^{o} S) which comprises the main fishing area of baitboats based at Rio de Janeiro: sub-area II (24^{o} S - 28^{o} S), which corresponds to the central area, where there is a major concentration of fishing operations by baitboats based at Santa Catarina; and sub-area III (South of 28^{o} S), which is the preferred area for the leased baitboats.

Monthly trends in sea surface temperature were also analysed in relation with skipjack catch. Data used comprised daily information on catch and temperature (^{o}C), which were collected through log books submitted by the Japanese leased baitboats, during the period 1989-1996. Although the same information was also available for Brazilian baitboats, data provided by the leased baitboats was considered to be more accurate and precise, covering a larger area and the number of observations available was also higher for this fleet.

Data on length frequency distribution of skipjack catches was obtained from size sampling carried out by IBAMA during the landings of the baitboat fleet at the ports of Rio de Janeiro, Itajai and Rio Grande, during the period 1985 - 1996. Each sample from a landing trip was composed of approximately 100 fish randomly selected, which were measured in fork length to the nearest lower centimeter, using a caliper. Annual mean length of the samples was calculated and statistical tests for significance of differences in mean lengths between fleets were applied

3. GENERAL CHARACTERISTICS OF THE AREA STUDIED

Baitboat fishing is carried out in an area that extends from 20^{o} S to 35^{o} S and from the eastern Brazilian coast to 37^{o} W of longitude. In general baitboat fishing concentrates along the continental slope, where depths are usually in the range of 80 to 500m. This area is characterized by important

seasonal changes in oceanographic conditions that affect the distribution and abundance of fishing resources.

The dominant water mass in the area is current of Brazil, which presents high values of temperature and low concentration of nutrient elements, typical of waters with low rates of gross primary production. It moves in a southwesterly direction carrying warm tropical waters along the continental self and continental slope. Another important water mass occurring in the area is the Falklands current, which presents low temperature and is rich in nutrients. When this current meets the Brazilian current at approximately near the estuary of Rio de La Plata, it forms the subtropical convergence, which during the year moves in north-south-north direction, resulting in seasonal variations in water conditions, which brings about space and time oscillations in the distribution and abundance of marine living resources from the region (Vazzoler, 1975).

According to Humber (1996), during the summer oceanographic conditions of the south region of Brazil are strongly influenced by warm waters of the Brazil Current, and temperature favourable for skipjack fishing dominate surface waters along the continental self and continental slope. In the winter, there is a reduced influence of Brazil current over waters of the continental self and waters favourable to skipjack fishing are restricted, basically, to fishing grounds north of 29^{o} S. During the autumn and spring months the southern waters off Brazil present a transition pattern between the extreme conditions that dominate during the winter and summer.

4. DEVELOPMENT OF THE BAITBOAT FISHERY

During the first years of development of the fishery the baitboat fleet showed a marked increase reaching 97 vessels in operation in 1982 (fig. 1). At that time, the fleet was composed mainly of small sized wooden vessels, which were originated primarily from the sardine fishery and by a few vessels from other coastal fisheries.

Due to the limitation in size of the adapted vessels (the smallest ones having lengths ranging from 10 to 15 m), which were built and equipped to operate in coastal fisheries, they have no navigation system for open sea. In addition, most of the fishermen had no previous experience in fishing far from the coast, and for this reason they used to concentrate their fishing operations around the many oil rig platforms located in front of the state of Rio de Janeiro, where there was always a good concentration of tuna schools.

By the mid of 1980, a regulation was issued prohibiting fishing operations around these oil platforms as a measure to prevent risks of accidents. This situation created difficulties for the operation of the smaller vessels, which could not operate in open sea and they had to limit their fishing operations to those periods of the year when fish schools were concentrated near the coast.

As a result, it was only the largest size vessels (greater than 15m) which could fish all year round, searching for tuna schools in open sea along the coasts of the states of São Paulo and Rio de Janeiro, in the southeast region of Brazil, and there was a sharp decrease in the number of vessels in operation from 1982 through 1984 (fig. 1).

Notwithstanding the sudden and marked increase in number of fishing vessels operating in the baitboat fishery, from 1980 through 1982, the biggest increase in catches occurred only in 1985, when the major part of the baitboat fleet expanded its fishing operations towards the south and passed to exploit more intensively this new fishing area. As a result of continued migration of fishing effort from the southeast to the south region of Brazil, a baitboat fleet was established at Itajai (Santa Catarina), which since 1985 has become the main landing port for the baitboat fleet.

In parallel with this expansion of the fishing area to the south, there was also a series of changes in vessel characteristics, which was most noticeable for the fleet based at Itajai, Santa Catarina. This fleet was also composed of new vessels that were designed and built to operate as baitboats and in this way have incorporated some characteristics of the leased fleet, such as bait wells with biggest capacity, freezing facilities on board and sufficient space on upper deck to carry a small boat to supply its own bait. As a result, vessel size stratification has been observed in the Brazilian baitboat fleet with small vessels concentrated in Rio de Janeiro and big size vessels in Santa Catarina (figs. 2-4).

However, during the year some vessels can operate based either in one or the other state, depending on the location of their fishing grounds that can be the south of Brazil, during the summer, or the southeast of Brazil during autumn and winter months. As a result, a seasonal pattern in distribution of fishing effort, which was observed first for the leased fleet is now observed also for some Brazilian baitboats, which concentrate their fishing effort in southeastern areas, from April to September, and in southern areas, from October to March (Tables 1-9).

5. BAITFISHING

The baitboat fishery is largely dependent on sufficient natural stocks of baitfishes needed to capture surface schooling tuna species in open ocean waters. For this reason, acute shortage of natural supplies of live baitfishes is a limiting factor preventing further expansion of existing baitboat fisheries. According with Lin et all (1998), the following species of small pelagic fish are used as baitfish by Brazilian baitboats: sardine (*Sardinella brasiliensis*), which is the most preferred one, anchovy (Anchoa sp.) and false herring (*Harengula sp.*). During the first years of development of the baitboat fishery, in Rio de Janeiro, there was plenty supplies of baitfishes, usually juvenile sardine that were abundant in shallows and bays along the Rio de Janeiro coast and were easily accessed by artisanal fishermen. These baitfishes were caught by small purse seiners and were kept in anchored fish cages until they were transferred to the baitboat's live bait wells. This system of baitfish supply was advantageous for the baitboats as they avoid spending time catching live bait and because the live bait stored in fish cages was just adapted to confinement conditions and their mortality rate was low.

However, as the main species used as live bait was sardine, whose stock was heavily exploited by the coastal Brazilian purse seine fishery, a size limit regulation was in place, aimed to increase the recruitment of adult fish. In this way, catches of juvenile sardine by small purse seiners to supply baitboat vessels with live bait was found to be contrary to conservation measures applied to the sardine fishery and there was increasing pressure from sardine fishermen to discourage this fishing practice.

This situation was aggravated by the fact that after supplying baitfish to baitboat vessels if there was still some baitfish stored in the cages, the remaining fish were usually directed to small fish markets.This practice was considered illegal as the sardine size regulation also prohibited that individual bellow the minimum catch size could be sold in the market.

In 1990, under strong pressure from sardine fishermen a regulation was issued to prevent this practice by establishing that all baitboats had to catch their own live bait. As a result, many small baitboats that were dependent on baitfishes supplied by the small purse seiners were withdrawn from the fishery.

Another fact that has affected baitfishing activities carried out by baitboats was the establishment of a marine protected area around Baia do Arvoredo, in the South of Brazil, which used to be an important baitfishing area. As juvenile sardines are abundant in this protected area, the baitboat fleet now spent much more time fishing for live bait, what created unfavourable conditions for further

expansion of the existing baitboat fishery as the less efficient vessels will have difficulties to continue in the fishery.

6. VESSEL CHARACTERISTICS

The analysis of data on vessel characteristics indicated that gross registered tonnage (GRT), carrying capacity and total length have shown a continuous increase for the baitboat fleet as a whole, during the period 1980-1996. The average length was 21.7 m in 1982, reached 24.3 m in 1989 and remained around 24 m through 1992, and increased to 26.8 m in 1996. During the same period (1982-1996) average GRT increased from 82.5 to 142.9 and carrying capacity increased from 53.9 MT to 84.4 MT (Fig. 5).

When vessels' characteristics were analysed separately for each landing port it was found that baitboats based at Rio de Janeiro shown small average length and GRT values in comparison with baitboats based at Santa Catarina. During the period 1980-1996, average length and GRT from vessels based at Rio de Janeiro were, respectively, 22.6m and 91.4 GRT while for vessels based at Santa Catarina average values were, respectively, 25.3 m and 123.9 GRT.

Figures 2-4 show annual changes in vessels' characteristics (total length, GRT and carrying capacity) for each landing port, during the period 1980 to 1996. In general, an increasing trend was observed for all vessels' characteristics. For baitboats based at Rio de Janeiro total length showed a sharp increase from 1980 to 1983 and a smooth increase was observed from 1983 to 1988, followed by a fall through 1991 when total length increased again. For the whole period (1980 to 1996) the general trend in total length was upward from 18.5m in 1980 to 24.1m in 1996. As for baitboats based at Santa Catarina, vessel size showed a continuous increasing trend from 1982 to 1992 and a marked increase was observed since then. For the whole period total length increased from 23.6m in 1982 to 28.2 m, in 1996. Similar increasing trends were also observed for the other vessel characteristics (GRT and carrying capacity) as can be seen from figures 3 and 4. During the last years, increase in vessel characteristics shown by baitboats based at Santa Catarina was due in part to the incorporation of large size leased baitboats to the Brazilian fleet.

7. TRENDS IN CATCH, EFFORT AND CPUE

Figure 6 presents annual skipjack tuna catches by landing port and fleet, from 1979 to 1997. During the first years of development of the fishery, from 1979 to 1982, total skipjack catches showed a sharp increase; from 1983 to 1987, catches showed a high year-to-year fluctuation, with a record catch of 25,051 MT being reached in 1985. During the period 1988 to 1994 catches have leveled off around 19,000 MT, and during the last years increased again reaching the peak catch of 25,573 MT, in 1997, which is slightly higher than the record catch observed in 1985. Preliminary estimates of skipjack catch for 1998 indicates a total catch of 24,793 MT. Figure 6 also shows that skipjack catches taken by baitboats based at Santa Catarina have increased at the expense of baitboats based at Rio de Janeiro whose skipjack catches have shown a consistent decreasing trend since 1985 and now represent less than 15% of the total skipjack catch. The Brazilian baitboats based at Santa Catarina are now the most important component of the Brazilian fleet in terms of number of boats and of total catch, taking half or more of the skipjack catch over the last eight years.

Nominal fishing effort, expressed in number of fishing days, for the entire baitboat fleet (Fig.7) reached a peak in 1985 (5358 fishing days), followed by a sharp decline through 1987, then increased again from 1987-91. Since 1991, there has been a declining trend to substantial low level in 1996,

which were almost half the peak effort recorded in 1985, although an increase was noted in 1997.There was a corresponding decrease in total skipjack catches from 1985-87 followed by a smooth increase from 1987 through 1989 and by a declining trend with some fluctuations until 1995 when catches increased steadily reaching the highest catch record (25573 MT) in 1997 (Fig. 6).

Figure 8 shows annual variation in nominal fishing effort for each segment of the baitboat fleet. Fishing effort for Brazilian baitboats based at Rio de Janeiro showed a consistent declining trend from high 1983 level to substantial low level in 1996, though a slight increase from 1987-90 is noted. As for Brazilian baitboats based at Santa Catarina, nominal fishing effort showed an opposite trend increasing continuously over the period 1983-93 (except for 1990). Fishing effort reached the highest level in 1993 then decreased through 1995 and increased from 1996-97. As a whole, trends in nominal fishing effort for both Brazilian baitboat fleets were matched by corresponding trends in skipjack catches, that is, skipjack catches taken by baitboats based at Rio de Janeiro showed a decreasing trend while catches for baitboats based at Santa Catarina showed an increasing trend (Fig.6).

As for leased baitboats, fishing effort decreased from high 1985 to low 1991 level and showed an increasing trend from 1991-95, followed by a decrease in 1997. In general a corresponding decrease was observed for skipjack catches from 1985 to 1991 (Figs. 6 and 8). As for the period 1991-96, trends in catch did not follow the ones observed for fishing effort, which may be due to the fact that since the mid of 1992 these vessels were nationalized and the Japanese crew was replaced by Brazilian crew, which probably might have resulted in temporary loss of fishing efficiency until the new crew could acquire a better knowledge of local fishing conditions. This is corroborated by low catch rates shown by this fleet, since 1991, which were almost half the catch levels during years before 1992. A recovery in skipjack catch rate was observed in 1997, reaching levels close to the ones prevailing before 1992 (Fig. 9).

Skipjack CPUE in weight (Fig. 9) for Japanese leased baitboats followed an increase/decrease cycle over 1984-87 and 1987-93, but generally increased from 1984 through 1991. In 1992 CPUE dropped drastically from high 1991 level (13.4 MT/day) and remained at low levels through 1995, increasing sharply during 1996-97 but still to a level bellow the 1989-91 average. A similar increase/decrease cycle in CPUE was also observed for Brazilian baitboats based at Santa Catarina over 1984-88 and 1988-92, followed by an increasing trend through 1996. Skipjack CPUE for Brazilian baitboats based at Rio de Janeiro are substantially less than those for the other fleets and apparently does not show any conclusive trends over the period 1983-97. During the period 1983-92 skipjack CPUE by leased baitboats were substantially higher than those of Brazilian baitboats based at Santa Catarina, however since then CPUE levels have been very close for both fleets though leased baitboat's CPUEs are still higher.

Japanese leased baitboats are larger and can stay longer at sea during a single fishing trip, as they are equipped with freezing facilities and great well's capacity for baitfish storage. These attributes could explain their best fishing performance in comparison with Brazilian baitboats. Another important factor to account for different fishing performance among vessels is the skill of the skipper and crew (Hilborn and Walters, 1995). In the case of the Japanese leased baitboats it was felt that higher skipjack CPUEs attained by these vessels were in part explained by the fact that the crew was composed of more specialized fishermen, specially the skipper and some crew members occupying critical posts or functions, such as, searching for surface schools. When these vessels were nationalized by mid 1992, Brazilian fishermen replaced this more specialized crew and until they have acquired better knowledge of local fishing conditions, it was expected that catch rates were low. This factor together with other distinct characteristics of these vessels could explain why skipjack CPUE dropped so drastically in 1992 and remained low over 1993-95, while skipjack CPUE for Brazilian baitboats based at Santa Catarina showed opposite trend though fishing in the same fishing area.

As for Brazilian baitboats based at Rio de Janeiro, the apparent absence of time trend in skipjack CPUE could be explained by the fact that some vessels might have directed fishing for yellowfin, concentrating effort in areas of high availability of this species, as it can be inferred from the highest percentage of yellowfin in catches from this fleet and by daily catch records from some fishing trips, in which catches are comprised only of yellowfin.

8. CATCH COMPOSITION

Skipjack tuna is the main species caught in the baitboat fishery representing about 90% of the total catch in weight, the second most important species caught is yellowfin (*Thunnus albacares*) whose catches represent 8% of the total catch. The other species caught are: albacore (*Thunnus alalunga*), blackfin tuna (*Thunnus atlanticus*), frigate tuna (*Auxis Thazard*), Atlantic little tuna (*Euthynnus alletteratus*) and dolphin fish (*Coriphaena hippurus*) (Fig. 10).

Species percentage composition in catches taken by leased Japanese baitboats was very close to the one shown by Brazilian baitboats based at Santa Catarina, which seems to indicate that these vessels follow a similar fishing pattern in space and time. As for baitboats based at Rio de Janeiro, the number of species caught is higher and the percentage composition of yellowfin is much bigger (14.8%) in relation with both Brazilian baitboats based at Santa Catarina (5.0%) and leased baitboats (1.3%), as can be seen from figure 11.

9. SEASONAL DISTRIBUTION OF CATCHES

Skipjack is caught all year round with catches showing high variability with seasons. For Brazilian baitboats based at Santa Catarina, catches peak during the summer months while for baitboats based at Rio de Janeiro the highest catches occur during autumn months. As for skipjack catches taken by the leased baitboats, they have shown the same pattern of seasonality observed for Brazilian baitboats of Santa Catarina. In general, skipjack catches remain at high levels during the whole summer period and beginning of Autumn, decreasing to low levels during the winter (July - September) and increasing again by the middle of spring (Fig. 12). The winter season is characterized by the presence of strong winds, which make difficult to search for tuna schools swimming at surface waters, and by lower sea temperatures. During this time fishing yields drop so much that the leased vessels stop fishing almost entirely and usually are docked at shipyards for making maintenance services.

According with Castello and Habiaga (1989) the highest skipjack catches that are observed between November and May off southeastern Brazil, are probably associated with the migration pattern of the species, which is determined by the oceanic circulation of water masses in this region. In this case, they assume that skipjack schools migrate to the south of Brazil searching for their optimum temperature range, following water masses of current of Brazil, which are influenced by the subtropical convergence of Southern Atlantic, when they met with cold waters from the Falkland current flowing northward.

Trends in yellowfin catches are not clearly identified except for Brazilian baitboats based at Rio de Janeiro whose total catch present a higher proportion of yellowfin than the Brazilian and foreign flagged baitboats based at Santa Catarina. This seems to indicate that part of the baitboats from Rio de Janeiro could be directing fishing effort to yellowfin or that they operate in fishing areas with a greater availability of yellowfin. Average monthly catches of yellowfin taken by each fleet are shown in Fig 13, in which a marked peak is shown during April – May for Rio de Janeiro-based baitboats.

From the analysis of figures 12 and 13 it is suggested that for baitboats from Rio de Janeiro seasonal variability in catches of yellowfin appear to be more clearly indicated than for skipjack.

The seasonality of skipjack abundance can be seen from the examination of plots of nominal CPUE for each fleet, by year and season in figure 14, covering the period from 1990 to 1996. It is noted a consistent pattern of higher CPUE during the first quarter, for both leased and Santa Catarina baitboat fleets, and smaller CPUE during the third quarter for all fleets. For the Rio de Janeiro fleet, CPUE trends by season are not consistent over the years, however it is noted that the highest CPUEs have mainly occurred in the first and second quarters.

Figure 15 shows a plot of average monthly sea surface temperature (^{o} C) over the years 1989-1996 indicating a positive correlation of sea temperature with abundance or availability of skipjack catches, when this figure is analysed in combination with figures 12 and 14.

10. GEOGRAPHICAL DISTRIBUTION OF CATCH AND EFFORT

Tables 1, 2 and 3 show the percentage distribution of fishing effort by 1^{o} x 1^{o} area, for the Brazilian baitboats based at Rio de Janeiro, in three distinct time periods (I: 1983-1985; II: 1986-1992 and III: 1993-1998). Tables 4, 5 and 6, and Tables 7, 8 and 9 show the percentage distribution of fishing effort by the same time-area strata for Brazilian baitboats based at Santa Catarina and for the Japanese leased baitboats, respectively. In these tables each fleet's percentage distribution of fishing effort is also presented for a sub-division of the total fishing area in three sub-areas (I: 20 ^{o} - 24 ^{o} S; II: 24^{o} S - 28^{o} S and III: South of 28 ^{o} S).

From the analysis of these tables it is shown that each fleet presents a distinct fishing pattern, characterized by a concentration of fishing effort in different areas during the year. Table 1, show that baitboats based at Rio de Janeiro fished between 20 ^{o} S and 31^{o} S, during the first period (1983-1985) with fishing effort being evenly distributed in sub-areas I and II. In these sub-areas the highest concentration of fishing effort was observed in statistical blocks 22040 and 24044.

The analysis of data in tables 2 and 3 over the years show an increasing concentration of fishing effort by baitboats from Rio de Janeiro in sub-area I, with 79.9% of the total fishing effort applied in this sub-area during the period 1993-1996. It is worth to mention that almost all of this effort was applied in statistical block 22040 (77.1%), in which yellowfin catches were always higher in relation with these species catches obtained from other statistical blocks. It has also been observed that during the last years total yellowfin catches taken by the Rio de Janeiro fleet have shown an increasing trend, almost surpassing skipjack catches which is the dominant species in the baitboat fishery. As for sub-area III, levels of fishing effort applied in this area were always low not exceeding 1% of the total effort.

In general, it can be concluded that baitboats based at Rio de Janeiro expanded its fishing area towards the south of Brazil, specially during years 1986 through 1992 and, for the last years, there has been a move towards fishing areas located at the north limit of the total fishing area, which could probably be associated with changes in fishing strategy, either as a result of reallocation of the biggest vessels to Santa Catarina or a shift in target species, from skipjack to yellowfin.

Brazilian baitboats based at Santa Catarina fished in the whole fishing area (from 20^{o} S to 35^{o} S), but their fishing operations were concentrated in a more restricted area, south of 25^{o} S where 2/3 of the total fishing effort was applied. During the first period (1983-1985) fishing effort was concentrated in sub-area III (55.4%), however, during the last years (1993-1996) fishing operations have been concentrated in sub-area II (24^{o} - 28^{o} S) where 58.9% of the total fishing effort has been

applied. As for sub-area I, less than 5% of the total effort was applied in this area. In general baitboat fishing in this area is carried out mainly from mid autumn to the end of winter (tables 4, 5 and 6).

It is important to note that in sub-area III the highest proportion of fishing effort was concentrated in 1^{o} x 1^{o} blocks located between 28^{o} S and 30^{o} S, while south of 30^{o} S fishing operations occurred only during the summer season (December to March)

Table 7 shows the percentage distribution of fishing effort by Japanese leased baitboats, during the years 1983-1985. The total fishing area extended from 18^{o} S to 35^{o} S and levels of fishing effort applied in sub-areas II and III were relatively close. During the second and third period (1986-1992 and 1993-1996) there was an increasing concentration of fishing effort in sub-area III, 65.9% and 73.3%, respectively (Tables 8 and 9). As for sub-area I, during all three periods analysed fishing effort levels were between 2.9 and 6.9%.

In general, Brazilian baitboats based at Santa Catarina show a seasonal fishing pattern, which is similar to the one observed for the leased baitboats: from December to April fishing operations are concentrated in the area between 25° S and 35° S and from May to November in the area between 22° S and 29° S.

The distribution of total fishing effort for all fleets combined per 1° x 1° block and by each time period is illustrated in figure 16. During 1983-1985 fishing effort was concentrated mainly in the area north of 25° S with low levels of effort being directed to blocks located south of latitude 30° S. The fishing area was expanded further to the south during 1986-1992 and the concentration of fishing effort in blocks off the southernmost region of Brazil has increased. For the last analysed period it is shown that fishing operations have covered the whole fishing area of the south and southeast regions of Brazil and there is a clear indication of three areas of fishing effort concentration within latitudinal lines 22° S and 35° S, which could be defined as block 22040; blocks between 25° S and 29° S; and blocks between 33° S and 35° S.

The geographical distribution of annual skipjack catches by each baitboat fleet and time period is illustrated in figure 17. In general, main skipjack catches by Rio de Janeiro-based fleet are taken from a restricted area between 22° S and 25° S, whereas main catches by Santa Catarina-based baitboats and by the leased baitboats are taken from a larger area, in which higher concentrations occur between 25° and 30°S and in the southernmost region of Brazil, respectively.

The distribution of skipjack catches by quarter and time period for each baitboat fleet is illustrated graphically in figures 18-26. In general, skipjack is caught in the whole fishing area of each baitboat fleet during the first and second quarter and it is caught in a more restricted area during the third quarter, usually in areas located north of latitude 29° S. There are relatively high concentrations of skipjack catches during all the year in the central part of the total fishing area, except for third quarter, whereas in the southernmost area the highest concentrations are restricted to first quarter. This seems to indicate that skipjack availability to baitboat fishery is gradually reduced from second to third quarter, off southern Brazil, with the possibility of reduction in vulnerability to the fishery in the third quarter, either as a result of a northward migration of skipjack schools or due to bad weather conditions prevailing in the region, characterized by strong winds and low sea temperatures, during the second and third quarter.

11. SKIPJACK LENGTH-FREQUENCY DISTRIBUTION

Figure 27 shows the combined length-frequency distribution of skipjack catches, for each segment

of the baitboat fleet, between 1985 and 1996. There is a similarity among the length frequencies of the three fleets, each one showing a single mode positioned at 58 cm, 55 cm and 56 cm, respectively for Rio de Janeiro, Santa Catarina and leased baitboats.

The length frequency distribution of baitboats based at Rio de Janeiro shows a larger size range, with a small size group (31 cm) and a large size group (90 cm), which is not seen in the catches of the other fleets, whose size range was 37 - 86 cm, for baitboats based at Santa Catarina, and 37 - 79 cm, for leased baitboats.

Skipjack mean lengths are also shown in Figure 27, indicating a relatively large mean size for Rio de Janeiro baitboats and a small mean size for leased baitboats. Though the differences in mean lengths of skipjack between fleets could be considered of little practical importance, results of analysis of variance, using the GLM procedure of the SAS System, showed that these differences in mean size were statistically significant at the probability level of 0.0001. Duncan's multiple-range test for post hoc comparisons was performed to investigate differences in skipjack mean size between fleets, with the results showing that there are significant differences among all three fleets ($p < 0.05$) (Table 10).

Figure 28 shows length frequency distributions of skipjack catches and average sizes of fish by year, between 1985 and 1996. It is shown that the patterns of the length frequency distributions were similar with fish between 48 and 62 cm being dominant over the years. Annual mean lengths varied from 54.75 cm (in 1991) to 58.59 cm (in 1995) and there is no indication of reduction in the size of fish.

The western Atlantic skipjack is also caught by the Venezuelan surface fisheries in the Caribbean Sea. According with Pagavino (1993) the size range of the length frequency distribution of these catches is wider, ranging from 22 cm to 96.5 cm.

In general, skipjack sizes from catches by the surface fisheries in the eastern Atlantic are smaller than in the western Atlantic. From the analysis of length frequency distributions of skipjack catches by Tema-based baitboats, between 1976 and 1982, Mensah and Kwei (1986) showed that the size range of fish was between 30 and 63 cm, with the dominance of fish with 41-49 cm fork length, and the average annual mean lengths varied from 43.86 cm to 44.92 cm.

From the analysis of cumulative fork length distribution of skipjack measured between 1985 and 1996 (Figure 29) it is shown that skipjack recruit into the Brazilian baitboat fishery from 50 cm to 60 cm, with a size at 50% recruitment of about 55cm.

Previous analysis of length frequency distributions of skipjack caught in Brazilian waters have been conducted by Jablonski and Matsuura (1985) and Vilela and Castello (1993), for data covering the years 1980-1983 and 1984-1986, respectively. Jablonski and Matsuura (1985) have found that the smallest length class present in the fishery during all years through 1980-1983, was 43 cm, with many fish smaller than 40 cm appearing in 1983, during the period April-June. In Venezuelan waters small skipjack are present in the fishery two times in a year, approximately during the months of August and May (Pagavino, 1993 and 1998). In their study Vilella and Castello (1993) showed that the smallest size class common to all years during 1984 and 1986 was 39 cm and they concluded that the size of total recruitment of skipjack into the fishery has remained, in average, at 55cm

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Table 1 - Monthly percentage distribution of fishing effort (number of fishing days) by 1º x 1º blocks and area for Brazilian baitboats based at Rio de Janeiro, during the period 1983 - 1985

ÁREAS	BLOCKS	MONTHS												TOTAL
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEZ	
I	2033	,	,	,	,	,	,	,	,	,	,	1.23	,	0.10
	2038	,	,	,	,	,	,	,	,	,	0.96	,	,	0.09
	2039	,	,	,	,	,	,	,	,	,	,	1.41	,	0.12
	2040	,	,	,	,	,	,	,	,	,	,	,	0.80	0.06
	2139	,	,	,	,	,	,	,	,	,	,	,	0.60	0.04
	2140	,	0.61	1.10	1.30	0.56	,	,	2.31	,	,	,	0.20	0.46
	2240	10.45	2.42	18.42	19.33	32.08	50.88	37.17	53.70	32.67	25.48	24.16	19.00	27.26
	2242	0.52	,	,	,	,	,	,	,	,	,	,	,	0.04
	2244	,	,	,	,	,	,	0.70	,	,	,	,	,	0.06
	2341	17.60	34.34	26.89	23.79	8.75	7.22	5.41	2.31	8.02	11.22	3.00	0.80	12.34
	2342	5.57	17.78	2.03	4.65	11.67	1.28	,	1.16	1.80	5.13	1.06	1.20	4.58
	2343	1.57	5.86	0.55	3.16	9.17	5.30	0.70	0.69	3.81	4.17	3.53	2.80	3.63
	2344	1.74	,	0.55	,	0.69	,	0.17	,	,	,	,	0.20	0.30
	2345	,	,	,	,	,	,	,	,	,	,	0.18	,	0.01
	Total I	**37.46**	**61.01**	**49.54**	**52.23**	**62.92**	**64.69**	**44.15**	**60.19**	**46.29**	**46.96**	**34.57**	**25.60**	**49.10**
II	2424	0.17	,	,	,	,	,	,	,	,	,	,	,	0.01
	2441	,	,	0.55	,	,	,	,	,	,	,	,	,	0.04
	2442	0.17	0.40	,	,	,	,	,	,	,	,	1.59	,	0.18
	2443	8.19	7.88	0.18	2.97	2.08	1.93	2.27	2.31	1.40	2.08	1.06	8.80	3.33
	2444	42.33	18.79	10.50	18.77	10.97	9.79	34.90	29.17	38.68	23.88	28.04	57.00	26.11
	2445	,	,	2.95	,	,	,	,	,	,	,	,	,	0.24
	2541	,	,	,	,	,	0.16	,	,	,	,	,	,	0.01
	2544	,	,	,	,	,	,	,	,	,	,	,	1.60	0.12
	2545	2.96	5.45	11.79	12.08	2.08	5.46	4.36	0.46	8.22	6.09	12.35	5.00	6.32
	2546	1.74	0.20	13.63	7.25	2.92	3.05	2.27	0.46	0.20	,	0.88	,	2.77
	2641	,	,	,	,	0.14	,	,	,	,	,	,	,	0.01
	2645	,	0.40	,	,	,	,	,	,	,	,	,	,	0.03
	2646	6.45	4.44	5.71	4.09	15.97	7.87	10.47	5.79	3.41	19.71	18.69	1.00	9.15
	2647	,	,	2.58	,	1.25	4.49	,	,	,	,	,	,	0.76
	2746	,	,	,	,	,	,	,	,	1.80	0.32	,	,	0.16
	2747	,	,	0.55	1.12	1.53	0.48	,	,	,	0.96	0.88	0.60	0.55
	2748	,	,	1.10	,	,	,	,	,	,	,	,	,	0.09
	Total II	**62.02**	**37.58**	**49.54**	**46.28**	**36.94**	**33.23**	**54.28**	**38.19**	**53.71**	**53.04**	**63.49**	**74.00**	**49.91**
III	2847	0.52	1.41	0.55	1.49	0.14	2.09	1.05	,	,	,	1.94	0.40	0.81
	2947	,	,	0.18	,	,	,	,	,	,	,	,	,	0.01
	3047	,	,	,	,	,	,	0.52	,	,	,	,	,	0.04
	3048	,	,	0.18	,	,	,	,	1.62	,	,	,	,	0.12
	Total III	**0.52**	**1.41**	**0.92**	**1.49**	**0.14**	**2.09**	**1.57**	**1.62**	**0.00**	**0.00**	**1.94**	**0.40**	**0.99**
	TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Table 2 - Monthly percentage distribution of fishing effort (number of fishing days) by 1º x 1º blocks and area for Brazilian baitboats based at Rio de Janeiro, during the period 1986 - 1992

		MONTHS												TOTAL
ÁREAS	BLOCKS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEZ	
I	2039	,	,	,	,	,	,	,	,	2.49	0.72	,	,	0.20
	2040	,	,	,	,	,	,	2.25	,	,	,	,	,	0.22
	2139	,	,	,	1.09	,	,	,	,	,	,	,	,	0.09
	2140	1.53	,	,	,	,	,	1.13	1.49	2.18	,	,	,	0.48
	2239	,	,	,	,	0.32	,	0.75	,	,	,	,	2.91	0.20
	2240	57.65	84.87	55.00	32.90	41.91	55.72	46.53	45.32	74.77	71.57	66.83	69.19	55.36
	2244	,	,	,	0.65	,	,	,	,	,	,	,	,	0.05
	2341	17.35	1.68	5.34	2.18	1.94	11.10	9.19	18.72	2.18	5.06	3.17	1.74	7.35
	2342	2.04	2.94	0.34	2.61	1.29	2.89	5.44	1.91	,	0.96	1.22	0.58	2.01
	2343	2.04	,	1.03	1.31	2.75	1.04	0.94	4.47	,	,	1.46	,	1.43
	2344	,	,	,	,	,	,	,	0.85	,	,	,	,	0.07
	Total	**80.61**	**89.50**	**61.72**	**40.74**	**48.22**	**70.75**	**66.23**	**72.77**	**81.62**	**78.31**	**72.68**	**74.42**	**67.46**
II	2441	,	,	,	,	,	,	,	,	,	0.72	,	,	0.05
	2443	1.53	,	0.69	1.09	0.16	6.47	7.88	0.21	,	1.20	0.24	8.14	2.47
	2444	8.42	3.36	13.10	25.05	42.56	16.18	20.26	12.34	5.61	9.64	13.17	5.81	16.86
	2445	1.28	,	,	,	,	,	,	,	,	0.24	2.44	,	0.29
	2545	2.81	4.20	5.34	19.83	5.66	5.55	3.00	2.98	,	2.65	1.22	2.91	5.06
	2546	,	,	1.72	,	,	,	,	0.85	,	,	1.95	,	0.40
	2645	,	,	,	,	,	,	,	,	,	,	0.24	,	0.02
	2646	5.36	2.94	12.07	4.58	3.24	0.92	2.63	10.85	12.77	6.75	7.80	8.72	5.99
	2647	,	,	0.17	,	,	,	,	,	,	,	0.24	,	0.04
	2747	,	,	1.38	4.36	0.16	0.12	,	,	,	,	,	,	0.55
	Total	**19.39**	**10.50**	**34.48**	**54.90**	**51.78**	**29.25**	**33.77**	**27.23**	**18.38**	**21.20**	**27.32**	**25.58**	**31.74**
III	2847	,	,	1.72	4.36	,	,	,	,	,	0.48	,	,	0.58
	2848	,	,	0.86	,	,	,	,	,	,	,	,	,	0.09
	2948	,	,	1.03	,	,	,	,	,	,	,	,	,	0.11
	3350	,	,	0.17	,	,	,	,	,	,	,	,	,	0.02
	Total	0.00	0.00	3.79	4.36	0.00	0.00	0.00	0.00	0.00	0.48	0.00	0.00	0.80
	TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Table 3 - Monthly percentage distribution of fishing effort (number of fishing days) by 1º x 1º blocks and area for Brazilian baitboats based at Rio de Janeiro, during the period 1993 - 1996

		MONTHS												TOTAL
ÁREAS	BLOCKS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEZ	
I	*	,	,	,	,	,	1.34	,	,	,	,	,	,	0.10
	2239	,	,	,	,	,	,	,	1.65	,	,	,	,	0.15
	2240	72.29	84.37	74.39	64.59	70.59	80.27	73.53	80.00	81.65	86.40	73.38	97.78	77.14
	2341	1.74	1.07	,	,	,	,	2.13	,	,	,	2.73	,	0.62
	2342	,	,	1.58	,	1.79	5.36	3.02	,	,	1.92	0.17	,	1.19
	2343	,	,	,	,	,	,	3.55	,	,	,	,	,	0.29
	2344	,	,	,	,	,	,	,	4.79	,	,	,	,	0.43
	Total I	**74.03**	**85.44**	**75.97**	**64.59**	**72.38**	**86.97**	**82.24**	**86.45**	**81.65**	**88.31**	**76.28**	**97.78**	**79.92**
II	2441	2.91	,	,	,	,	,	,	,	,	,	3.07	,	0.49
	2442	,	,	0.43	4.96	3.96	3.26	13.50	5.12	,	,	4.78	,	3.25
	2443	,	,	3.02	7.08	1.15	,	3.20	,	12.14	1.15	0.68	,	2.28
	2444	0.58	2.78	1.29	3.40	11.38	4.79	,	,	,	,	,	,	2.40
	2445	3.68	2.78	0.43	8.78	6.52	1.15	1.07	,	,	1.34	4.61	,	2.85
	2544	13.76	,	5.32	5.10	1.28	,	,	,	,	,	,	,	2.26
	2545	5.04	7.92	7.19	4.82	2.81	3.45	,	8.43	6.20	1.34	4.78	2.22	4.51
	2546	,	1.07	,	,	,	,	,	,	,	,	0.85	,	0.15
	2547	,	,	,	,	,	,	,	,	,	3.83	,	,	0.29
	2645	,	,	,	1.27	,	,	,	,	,	,	,	,	0.13
	2647	,	,	,	,	0.51	,	,	,	,	,	4.95	,	0.49
	2746	,	,	3.31	,	,	,	,	,	,	,	,	,	0.34
	2747	,	,	,	,	,	0.38	,	,	,	4.02	,	,	0.34
	Total II	**25.97**	**14.56**	**21.01**	**35.41**	**27.62**	**13.03**	**17.76**	**13.55**	**18.35**	**11.69**	**23.72**	**2.22**	**19.77**
III	2947	,	,	3.02	,	,	,	,	,	,	,	,	,	0.31
	Total III	**0.00**	**0.00**	**3.02**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.31**
	TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Table 4 - Monthly percentage distribution of fishing effort (number of fishing days) by 1º x 1º blocks and area for Brazilian baitboats based at Santa Catarina, during the period 1983 - 1985

		MONTHS												TOTAL
ÁREAS	BLOCKS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEZ	
I	*	0.95	,	,	1.34	2.94	,	,	15.15	8.45	26.58	5.08	2.94	3.62
	2243	,	,	,	,	,	,	,	,	,	1.27	,	,	0.08
	2341	,	,	,	1.34	,	,	,	,	,	,	,	,	0.23
	2342	,	,	,	1.34	,	,	,	,	,	1.27	,	,	0.31
	2343	,	,	,	,	,	,	,	,	,	,	,	5.88	0.31
	2344	,	,	,	,	0.49	,	,	,	,	,	,	2.94	0.23
	2345	,	,	,	,	,	,	,	,	,	,	,	4.41	0.23
	Total I	**0.95**	**0.00**	**0.00**	**4.02**	**3.43**	**0.00**	**0.00**	**15.15**	**8.45**	**29.11**	**5.08**	**16.18**	**5.00**
II	2443	,	,	,	,	0.49	1.61	,	3.03	,	,	,	,	0.31
	2444	5.71	,	,	0.45	2.45	,	,	6.06	,	,	,	1.47	1.15
	2445	,	,	0.93	,	3.43	1.61	,	12.12	,	,	1.69	,	1.15
	2446	,	,	0.93	,	,	,	,	,	,	2.53	,	,	0.23
	2544	,	,	,	,	0.49	,	1.85	,	,	,	,	,	0.23
	2545	,	,	2.78	4.02	,	12.10	,	6.06	11.27	6.33	5.08	2.94	3.62
	2546	5.71	2.56	4.63	4.46	7.84	28.23	14.81	,	,	17.72	,	10.29	8.62
	2547	,	,	2.78	0.45	0.49	,	,	,	,	3.80	,	,	0.62
	2548	0.95	,	1.85	,	0.49	2.42	,	,	,	6.33	1.69	,	1.00
	2645	,	,	,	,	,	,	1.85	3.03	,	1.27	,	,	0.31
	2646	,	,	,	,	2.45	5.65	1.85	,	,	6.33	3.39	1.47	1.69
	2647	,	,	4.63	0.89	3.43	4.03	6.48	,	,	,	3.39	,	2.15
	2648	,	,	1.85	,	4.41	,	0.93	,	,	3.80	,	,	1.15
	2744	1.90	,	,	,	,	,	,	,	,	,	,	,	0.15
	2746	4.76	,	,	,	,	,	2.78	,	,	,	,	,	0.62
	2747	11.43	11.11	6.48	11.16	26.96	5.65	9.26	27.27	21.13	5.06	1.69	1.47	12.23
	2748	2.86	5.13	2.78	4.02	0.49	1.61	14.81	3.03	4.23	2.53	15.25	1.47	4.31
	Total II	**33.33**	**18.80**	**29.63**	**25.45**	**53.43**	**62.90**	**54.63**	**60.61**	**36.62**	**55.70**	**32.20**	**19.12**	**39.54**
III	2837	,	0.85	0.93	0.89	,	,	,	,	,	,	,	1.47	0.38
	2838	,	,	0.93	,	,	,	,	,	,	,	,	,	0.08
	2840	,	,	,	,	,	,	,	,	,	1.27	,	,	0.08
	2846	,	,	,	,	,	,	2.78	,	,	,	,	,	0.23
	2847	42.86	18.80	11.11	47.32	34.80	24.19	19.44	18.18	18.31	6.33	28.81	27.94	28.23
	2848	3.81	14.53	14.81	1.79	2.94	8.06	9.26	,	7.04	7.59	13.56	8.82	7.08
	2947	13.33	5.98	0.93	4.91	0.49	1.61	13.89	3.03	26.76	,	13.56	19.12	7.08
	2948	3.81	23.93	5.56	2.23	1.47	3.23	,	,	2.82	,	1.69	7.35	4.46
	2949	,	,	,	0.45	,	,	,	,	,	,	,	,	0.08
	3048	,	2.56	1.85	,	1.47	,	,	,	,	,	,	,	0.62
	3049	1.90	6.84	1.85	2.68	0.49	,	,	,	,	,	5.08	,	1.69
	3149	,	2.56	0.93	1.34	0.49	,	,	3.03	,	,	,	,	0.69
	3150	,	0.85	3.70	,	,	,	,	,	,	,	,	,	0.38
	3151	,	1.71	,	,	,	,	,	,	,	,	,	,	0.15
	3250	,	,	,	0.89	0.98	,	,	,	,	,	,	,	0.31
	3251	,	,	10.19	4.91	,	,	,	,	,	,	,	,	1.69
	3350	,	2.56	7.41	0.45	,	,	,	,	,	,	,	,	0.92
	3351	,	,	10.19	2.68	,	,	,	,	,	,	,	,	1.31
	Total III	**65.71**	**81.20**	**70.37**	**70.54**	**43.14**	**37.10**	**45.37**	**24.24**	**54.93**	**15.19**	**62.71**	**64.71**	**55.46**
	TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

* Bloco não identificado.

Table 5 - Monthly percentage distribution of fishing effort (number of fishing days) by 1º x 1º blocks and area for Brazilian baitboats based at Santa Catarina, during the period 1986 - 1992

ÁREAS	BLOCKS	MONTHS												TOTAL
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEZ	
I	*	,	,	,	0.39	0.64	,	,	,	,	,	1.72	,	0.20
	2040	,	,	,	,	,	,	,	,	,	,	,	1.64	0.04
	2239	,	,	,	,	,	0.44	,	,	,	,	,	,	0.04
	2240	,	,	,	,	,	3.07	0.86	2.03	,	,	,	,	0.49
	2241	,	,	,	,	,	,	,	0.68	,	,	,	,	0.04
	2341	,	,	,	,	0.32	2.63	2.59	,	,	,	,	,	0.53
	2342	,	,	,	0.39	2.23	1.75	1.72	0.68	,	,	,	6.56	0.86
	2343	,	,	,	1.56	2.55	0.44	0.43	2.03	0.78	,	,	,	0.73
	2344	,	,	,	0.78	2.23	2.19	1.72	2.70	17.19	,	0.86	6.56	2.00
	2345	,	,	,	,	,	,	,	0.68	,	,	,	,	0.04
	Total I	**-**	**-**	**-**	**3.13**	**7.96**	**10.53**	**7.33**	**8.78**	**17.97**	**-**	**2.59**	**14.75**	**4.97**
II	2443	,	,	0.26	3.91	4.78	4.39	9.48	2.03	4.69	,	,	1.64	2.77
	2444	,	,	1.57	12.89	10.83	13.60	8.19	7.43	6.25	6.45	6.90	4.92	6.47
	2445	,	,	,	0.39	1.91	4.39	2.59	,	4.69	,	5.17	6.56	1.59
	2446	,	,	0.26	,	2.55	,	,	,	,	3.23	4.31	,	0.69
	2544	,	0.48	,	1.17	1.59	,	,	0.68	,	,	,	,	0.41
	2545	,	0.96	2.36	3.13	2.55	13.16	15.52	4.73	6.25	,	4.31	3.28	4.68
	2546	4.88	9.13	12.34	5.86	8.60	15.79	23.71	32.43	5.47	26.88	5.17	6.56	12.50
	2547	2.44	2.88	1.31	1.17	0.64	0.88	,	,	,	,	,	,	1.02
	2644	,	1.92	,	,	,	,	,	,	,	,	,	,	0.16
	2645	,	,	,	,	0.96	4.82	1.72	,	,	,	,	,	0.73
	2646	3.83	0.96	10.50	10.16	7.32	12.28	23.71	14.19	17.19	1.08	3.45	4.92	9.61
	2647	6.27	2.40	16.27	10.55	3.82	10.09	3.02	11.49	12.50	9.68	10.34	3.28	8.55
	2648	,	0.48	2.10	,	,	,	,	,	,	,	,	,	0.37
	2746	,	,	0.26	0.39	,	0.44	0.43	2.03	,	,	0.86	,	0.33
	2747	4.88	2.88	5.25	8.20	7.01	4.39	2.16	6.08	9.38	16.13	17.24	9.84	6.51
	2748	,	6.25	1.57	1.56	5.10	0.44	,	,	0.78	9.68	,	1.64	2.08
	Total II	**22.30**	**28.37**	**54.07**	**59.38**	**57.64**	**84.65**	**90.52**	**81.08**	**67.19**	**73.12**	**57.76**	**42.62**	**58.47**
III	2847	18.12	15.87	4.20	16.02	30.57	4.39	1.29	5.41	14.06	26.88	22.41	16.39	13.76
	2848	13.59	7.69	12.60	3.13	0.64	,	0.43	,	0.78	,	9.48	4.92	5.25
	2947	14.98	3.85	2.62	8.59	3.18	0.44	,	4.73	,	,	6.03	16.39	4.80
	2948	2.09	2.88	2.10	0.39	,	,	0.43	,	,	,	1.72	,	0.98
	2949	,	0.48	0.26	,	,	,	,	,	,	,	,	,	0.08
	3048	1.05	2.40	0.52	,	,	,	,	,	,	,	,	1.64	0.45
	3049	2.79	2.88	0.79	,	,	,	,	,	,	,	,	,	0.69
	3050	0.35	6.73	1.31	0.78	,	,	,	,	,	,	,	,	0.90
	3149	1.74	4.33	3.67	,	,	,	,	,	,	,	,	3.28	1.22
	3150	2.09	0.96	0.26	0.78	,	,	,	,	,	,	,	,	0.45
	3151	,	,	0.26	,	,	,	,	,	,	,	,	,	0.04
	3249	0.70	,	,	,	,	,	,	,	,	,	,	,	0.08
	3250	11.50	10.10	6.82	6.64	,	,	,	,	,	,	,	,	3.95
	3251	,	,	0.79	,	,	,	,	,	,	,	,	,	0.12
	3350	6.27	8.17	7.35	1.17	,	,	,	,	,	,	,	,	2.69
	3351	2.09	4.33	1.05	,	,	,	,	,	,	,	,	,	0.77
	3352	,	0.96	1.31	,	,	,	,	,	,	,	,	,	0.29
	3451	0.35	,	,	,	,	,	,	,	,	,	,	,	0.04
	Total III	**77.70**	**71.63**	**45.93**	**37.50**	**34.39**	**4.82**	**2.16**	**10.14**	**14.84**	**26.88**	**39.66**	**42.62**	**36.56**
	TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

* Bloco não identificado.

Table 6 - Monthly percentage distribution of fishing effort (number of fishing days) by 1º x 1º blocks and area for Brazilian baitboats based at Santa Catarina, during the period 1993 - 1996

ÁREAS	BLOCKS	MONTHS												TOTAL
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEZ	
I	*	0.51	1.32	0.49	0.37	,	,	,	,	,	,	,	,	0.37
	2240	,	,	,	,	,	,	,	5.00	,	,	1.30	,	0.27
	2243	,	,	,	,	,	,	,	,	,	,	0.65	,	0.03
	2340	,	,	,	,	,	,	,	0.83	,	,	0.65	,	0.07
	2341	,	,	,	,	,	,	6.59	0.83	,	,	,	,	0.41
	2342	,	,	,	,	,	3.03	4.79	,	,	0.57	,	0.68	0.61
	2343	0.77	,	,	,	,	0.38	10.18	3.33	,	,	,	,	0.85
	2344	,	,	,	,	0.65	1.14	1.20	1.67	,	,	,	2.04	0.41
	2345	1.53	1.54	1.23	1.47	1.94	0.76	,	1.67	1.04	2.27	3.90	2.04	1.56
	2346	0.51	,	,	,	,	,	,	0.83	,	,	,	,	0.10
	Total I	**3.32**	**2.86**	**1.72**	**1.84**	**2.58**	**5.30**	**22.75**	**14.17**	**1.04**	**2.84**	**6.49**	**4.76**	**4.67**
II	2443	,	,	,	0.37	0.32	2.27	3.59	13.33	,	,	,	0.68	1.05
	2444	0.77	0.44	2.71	,	0.32	1.52	4.79	7.50	2.08	,	0.65	,	1.39
	2445	2.04	1.98	2.96	2.57	0.32	1.52	,	0.83	,	5.68	4.55	4.76	2.23
	2446	,	,	,	,	2.58	1.89	,	0.83	1.04	,	,	,	0.51
	2448	,	,	,	,	,	,	,	0.83	,	,	,	,	0.03
	2544	,	,	,	0.74	,	,	,	,	,	,	,	,	0.07
	2545	2.81	2.42	9.61	2.94	4.52	0.76	4.79	0.83	,	11.36	21.43	11.56	5.54
	2546	4.34	7.05	7.39	6.99	11.61	3.79	2.40	,	3.13	3.41	5.84	1.36	5.68
	2547	,	,	0.74	0.74	,	0.38	,	,	,	0.57	,	,	0.24
	2548	1.02	0.44	2.22	1.10	2.26	2.27	0.60	,	5.21	14.20	5.84	,	2.40
	2645	,	,	,	,	,	0.38	1.20	,	,	,	,	,	0.10
	2646	6.89	5.73	7.88	8.09	16.13	21.97	25.75	18.33	26.04	28.98	13.64	7.48	13.12
	2647	17.09	15.64	10.10	12.13	22.26	14.39	16.17	25.83	27.08	23.86	25.97	24.49	17.61
	2648	0.51	0.88	1.48	1.47	4.19	1.52	2.40	6.67	9.38	2.27	4.55	1.36	2.27
	2650	0.26	,	,	,	,	,	,	,	,	,	,	,	0.03
	2745	,	,	0.25	,	,	,	,	,	,	,	,	,	0.03
	2746	0.51	,	0.25	2.57	2.58	3.41	0.60	0.83	2.08	,	1.30	,	1.12
	2747	2.30	4.19	7.39	9.19	12.90	12.12	8.98	5.00	13.54	2.27	4.55	2.72	6.90
	2748	5.36	3.08	4.93	7.35	6.13	3.41	,	,	7.29	1.70	,	1.36	3.89
	Total II	**43.88**	**41.85**	**57.88**	**56.25**	**86.13**	**71.59**	**71.26**	**80.83**	**96.88**	**94.32**	**88.31**	**55.78**	**64.20**
III	2840	,	,	,	0.37	,	,	,	,	,	,	,	,	0.03
	2842	,	,	,	0.37	,	,	,	,	,	,	,	,	0.03
	2845	,	,	,	,	,	,	,	,	,	,	,	0.68	0.03
	2846	,	0.22	0.25	,	,	,	,	,	,	,	,	,	0.07
	2847	5.87	3.96	16.26	23.53	5.81	14.02	0.60	,	,	,	1.95	3.40	7.94
	2848	2.04	4.19	6.90	6.25	3.55	3.41	3.59	5.00	2.08	2.84	0.65	4.08	3.99
	2849	0.77	,	,	,	,	,	,	,	,	,	,	,	0.10
	2939	0.26	,	,	,	,	,	,	,	,	,	,	,	0.03
	2947	1.28	1.10	3.69	5.15	0.97	3.79	,	,	,	,	2.60	,	1.89
	2948	2.55	3.96	1.48	2.21	0.97	1.89	,	,	,	,	,	2.04	1.72
	2949	,	0.66	0.49	,	,	,	,	,	,	,	,	2.04	0.27
	2950	0.26	,	,	,	,	,	,	,	,	,	,	1.36	0.10
	3048	2.55	0.44	0.99	0.74	,	,	,	,	,	,	,	3.40	0.78
	3049	2.04	5.73	1.97	1.47	,	,	1.80	,	,	,	,	0.68	1.69
	3050	0.77	1.76	3.20	,	,	,	,	,	,	,	,	5.44	1.08
	3149	0.51	0.66	1.48	,	,	,	,	,	,	,	,	1.36	0.44
	3150	1.28	3.74	,	,	,	,	,	,	,	,	,	,	0.74
	3250	12.76	9.25	2.96	0.37	,	,	,	,	,	,	,	6.80	3.89
	3251	0.26	0.44	,	,	,	,	,	,	,	,	,	,	0.10
	3350	15.31	6.83	,	,	,	,	,	,	,	,	,	4.76	3.31
	3351	3.32	11.89	0.74	1.47	,	,	,	,	,	,	,	2.72	2.64
	3445	,	,	,	,	,	,	,	,	,	,	,	0.68	0.03
	3451	1.02	,	,	,	,	,	,	,	,	,	,	,	0.14
	3452	,	0.44	,	,	,	,	,	,	,	,	,	,	0.07
	TOTAL III	**52.81**	**55.29**	**40.39**	**41.91**	**11.29**	**23.11**	**5.99**	**5.00**	**2.08**	**2.84**	**5.19**	**39.46**	**31.14**
	TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

* Bloco não identificado.

Table 7 - Monthly percentage distribution of fishing effort (number of fishing days) by 1º x 1º blocks and area for leased baitboats, during the period 1983 - 1985

	MONTHS												TOTAL
BLOCKS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEZ	
1836	,	,	,	,	,	,	,	0.68	,	,	,	,	0.06
1837	1.27	,	,	,	,	,	,	0.68	,	,	,	,	0.11
1937	2.53	,	,	,	,	,	,	,	0.62	,	,	,	0.17
1938	,	,	0.53	,	,	,	,	,	1.23	,	,	,	0.17
2032	,	,	,	,	,	,	,	,	0.62	,	,	,	0.06
2033	,	,	,	,	,	,	,	,	0.62	,	,	,	0.06
2036	,	,	,	,	,	,	,	1.36	2.47	,	,	,	0.34
2037	,	,	,	,	,	,	1.61	9.52	2.47	,	,	,	1.13
2038	1.27	,	,	,	0.46	,	,	,	,	,	,	,	0.11
2039	,	,	,	,	0.46	,	,	,	,	,	,	,	0.06
2134	,	,	,	,	,	,	,	,	0.62	,	,	,	0.06
2137	,	,	,	,	,	,	,	1.36	,	,	,	,	0.11
2138	,	,	,	,	,	,	0.81	0.68	,	,	,	,	0.11
2139	,	,	,	,	,	,	,	0.68	,	,	,	,	0.06
2140	,	,	,	,	,	,	0.81	,	0.62	,	,	,	0.11
2237	,	,	,	,	,	,	0.81	,	,	,	,	,	0.06
2239	,	,	,	,	,	,	,	1.36	1.85	,	,	,	0.28
2240	2.53	,	1.06	0.51	0.46	0.51	2.42	1.36	1.23	,	,	,	0.79
2243	,	,	,	,	,	,	,	,	,	,	1.46	,	0.11
2340	,	,	0.53	,	,	,	1.61	,	,	,	,	,	0.17
2341	,	,	1.06	1.02	,	,	3.23	2.72	4.32	,	,	,	1.07
2342	,	,	0.53	,	,	1.03	,	,	5.56	,	,	,	0.68
2343	1.27	,	,	0.51	,	1.03	,	,	2.47	,	,	,	0.45
2344	1.27	,	0.53	,	,	1.03	0.81	1.36	0.62	0.76	,	,	0.51
2345	,	,	,	,	,	0.51	,	,	,	,	,	,	0.06
	10.14	0.00	4.24	2.04	1.38	4.11	12.11	21.76	25.32	0.76	1.46	0.00	6.90
2442	,	,	,	,	,	,	,	1.36	1.85	,	,	,	0.28
2443	,	,	0.53	,	1.38	1.03	7.26	4.76	8.64	1.52	,	1.03	2.20
2444	,	1.00	1.59	1.02	2.29	5.64	8.87	7.48	28.40	3.79	2.19	,	5.52
2445	,	,	,	,	,	,	0.81	1.36	0.62	0.76	1.46	,	0.39
2446	,	,	,	,	0.46	,	,	,	,	,	0.73	,	0.11
2544	,	,	,	1.02	0.92	0.51	,	5.44	3.09	,	1.46	,	1.13
2545	2.53	2.00	12.70	7.65	16.10	17.40	33.10	17.00	20.40	30.30	14.60	4.12	15.50
2546	,	,	0.53	1.53	3.21	7.69	6.45	4.08	1.23	3.03	,	2.06	2.70
2645	,	,	,	,	,	1.03	1.61	2.04	1.23	0.76	0.73	1.03	0.68
2646	12.70	5.00	6.35	8.67	19.30	15.90	9.68	21.80	4.32	10.60	4.38	11.30	11.20
2647	1.27	,	0.53	0.51	1.38	,	,	,	,	,	,	1.03	0.39
2648	,	,	,	,	0.46	,	,	,	,	,	,	,	0.06
2746	1.27	,	0.53	1.02	0.46	6.15	2.42	7.48	3.09	3.03	2.92	3.09	2.65
2747	7.59	3.00	4.76	7.14	8.72	16.90	10.50	2.72	1.23	18.20	9.49	5.15	8.16
2748	,	,	,	,	0.46	,	,	,	,	,	,	,	0.06
	25.36	11.00	27.52	28.56	55.14	72.25	80.70	75.52	74.10	71.99	37.96	28.81	51.03
2847	26.60	12.00	13.20	35.20	24.30	23.10	6.45	2.72	,	21.20	17.50	21.60	17.50
2848	1.27	1.00	0.53	,	,	,	,	,	,	,	1.46	2.06	0.39
2947	3.80	3.00	0.53	1.02	0.46	0.51	,	,	0.62	2.27	1.46	2.06	1.07
2948	,	3.00	5.29	4.08	1.38	,	,	,	,	1.52	8.76	3.09	2.31
2949	,	,	,	,	,	,	,	,	,	,	0.73	,	0.06
3043	,	,	,	,	,	,	,	,	,	,	,	1.03	0.06
3047	,	2.00	0.53	,	0.46	,	0.81	,	,	,	,	,	0.28
3048	3.80	8.00	3.17	9.18	12.40	,	,	,	,	2.27	14.60	10.30	5.35
3049	1.27	7.00	2.12	1.02	,	,	,	,	,	,	4.38	4.12	1.35
3145	1.27	,	,	,	,	,	,	,	,	,	,	,	0.06
3149	6.33	6.00	2.12	2.04	,	,	,	,	,	,	2.19	9.28	1.75
3150	3.80	3.00	,	,	,	,	,	,	,	,	3.65	3.09	0.79
3250	6.33	13.00	10.10	2.55	0.46	,	,	,	,	,	5.84	11.30	3.49
3350	2.53	14.00	21.70	6.63	2.75	,	,	,	,	,	,	3.09	4.45
3351	7.59	17.00	8.47	6.63	0.92	,	,	,	,	,	,	,	3.04
3451	,	,	0.53	1.02	0.46	,	,	,	,	,	,	,	0.23
	64.59	89.00	68.29	69.37	43.59	23.61	7.26	2.72	0.62	27.26	60.57	71.02	42.18
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Table 8 - Monthly percentage distribution of fishing effort (number of fishing days) by 1º x 1º blocks and area for leased baitboats, during the period 1986 - 1992

	MONTHS												TOTAL
BLOCKS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEZ	
*	,	,	,	,	,	,	,	,	,	,	1.35	2.48	0.39
1035	,	,	,	,	,	,	1.05	,	,	,	,	,	0.02
1135	,	,	,	,	,	,	1.05	,	,	,	,	,	0.02
1444	,	,	,	,	,	,	1.05	,	,	,	,	,	0.02
1538	,	,	,	,	,	,	1.05	,	,	,	,	,	0.02
1631	,	,	,	,	,	,	1.05	,	,	,	,	,	0.02
1738	,	,	,	,	,	,	1.05	,	,	,	,	,	0.02
1929	,	,	,	,	,	,	1.05	,	,	,	,	,	0.02
1939	,	,	,	,	,	,	1.05	,	,	,	,	,	0.02
2031	,	,	,	,	,	,	1.05	,	,	,	,	,	0.02
2034	,	,	,	,	,	,	1.05	,	,	,	,	,	0.02
2037	,	,	,	,	,	0.33	,	,	,	,	,	,	0.02
2039	,	,	,	,	,	0.33	,	1.25	,	,	,	,	0.05
2040	,	,	,	,	,	0.33	,	,	,	,	,	,	0.02
2138	,	,	,	,	,	0.33	,	,	,	,	,	,	0.02
2235	,	,	,	,	,	,	1.05	,	,	,	,	,	0.02
2237	,	,	,	,	,	,	1.05	,	,	,	,	,	0.02
2239	,	,	,	,	,	,	,	1.25	,	,	,	,	0.02
2240	,	,	,	,	0.22	0.33	,	1.25	,	,	,	,	0.07
2243	,	,	,	,	,	,	,	,	,	,	0.23	,	0.02
2340	,	,	,	,	,	0.66	2.11	,	,	,	,	,	0.10
2341	,	,	,	,	1.08	2.95	6.32	1.25	,	,	,	,	0.51
2342	,	,	,	0.20	0.65	2.30	3.16	2.50	1.67	0.68	,	,	0.49
2343	,	,	,	0.80	0.87	1.64	2.11	1.25	,	,	0.23	,	0.42
2344	,	,	0.20	2.39	0.65	0.33	,	,	0.83	,	0.23	,	0.46
2345	,	,	,	,	,	0.33	,	,	,	0.34	0.45	,	0.10
	-	-	0.20	3.39	3.47	9.86	26.30	8.75	2.50	1.02	2.49	2.48	2.93
2441	,	,	,	,	,	,	,	1.25	,	,	,	,	0.02
2442	,	,	,	,	,	0.33	,	1.25	,	,	,	,	0.05
2443	0.42	0.25	0.20	3.18	5.64	15.40	7.37	5.00	3.33	3.77	0.68	1.24	3.11
2444	1.67	0.25	0.80	8.95	4.77	11.50	10.50	10.00	5.83	6.16	1.81	2.98	4.36
2445	0.21	,	0.20	1.19	0.22	,	,	,	0.83	0.34	0.68	0.25	0.37
2448	,	,	,	,	,	0.33	,	,	,	,	,	,	0.02
2476	,	,	,	,	,	,	,	,	0.83	,	,	,	0.02
2542	,	,	,	,	,	,	,	,	,	,	,	0.25	0.02
2544	,	,	,	0.20	0.43	0.33	3.16	,	,	0.68	0.23	0.25	0.27
2545	1.46	0.25	1.99	5.77	7.38	9.51	27.40	22.50	16.70	11.00	7.00	2.48	6.04
2546	0.21	,	1.39	2.19	1.95	2.30	1.05	2.50	3.33	5.48	1.35	0.50	1.61
2547	,	,	,	,	,	0.33	,	,	,	,	,	0.25	0.05
2548	,	,	,	,	,	,	,	,	,	,	0.23	,	0.02
2645	,	,	,	,	0.22	,	,	1.25	0.83	,	,	,	0.07
2646	1.26	0.50	0.80	5.96	8.89	8.85	9.47	21.30	25.80	13.40	6.09	2.48	5.95
2647	0.63	0.25	0.40	1.19	0.87	1.31	,	2.50	0.83	,	0.68	0.25	0.66
2648	,	,	,	,	0.22	,	,	,	,	,	,	,	0.02
2738	,	,	,	,	,	,	,	1.25	,	,	,	,	0.02
2740	,	,	,	,	,	,	,	1.25	,	,	,	,	0.02
2746	,	,	0.40	0.99	5.64	4.59	,	1.25	7.50	2.40	2.26	0.25	1.84
2747	1.26	0.99	6.16	6.56	10.20	8.85	4.21	3.75	9.17	11.00	6.55	3.72	5.92
2748	1.05	,	0.20	0.40	0.87	0.66	,	1.25	,	0.34	0.45	,	0.44
2749	,	,	,	,	0.22	,	,	,	,	,	,	,	0.02
	8.17	2.74	12.54	36.58	47.52	64.29	63.16	76.30	74.98	54.57	28.01	14.90	30.94
2847	8.16	2.48	15.50	20.30	34.30	24.60	10.50	15.00	21.70	42.50	33.90	14.10	20.60
2848	0.84	0.25	0.20	,	0.22	,	,	,	,	0.34	0.45	0.25	0.27
2943	,	,	,	,	,	,	,	,	,	,	,	0.25	0.02
2946	0.21	,	,	,	,	,	,	,	,	,	,	,	0.02
2947	0.84	,	0.40	0.99	,	0.33	,	,	,	0.34	1.13	0.74	0.51
2948	4.81	3.96	1.79	2.78	3.04	0.33	,	,	,	0.34	7.67	7.44	3.47
2949	,	,	0.20	0.20	,	,	,	,	,	,	,	,	0.05
3047	,	,	0.20	,	0.22	,	,	,	,	,	,	,	0.05
3048	8.37	3.47	1.39	1.79	6.72	0.33	,	,	0.83	1.03	11.50	8.93	4.72
3049	5.65	2.23	1.59	0.60	,	,	,	,	,	,	1.81	2.48	1.59
3050	,	,	0.20	,	,	,	,	,	,	,	,	,	0.02
3146	0.63	,	,	,	,	,	,	,	,	,	,	,	0.07
3147	0.21	,	,	,	,	,	,	,	,	,	,	,	0.02
3149	7.11	1.98	3.78	2.39	0.87	,	,	,	,	,	5.19	6.70	3.11
3150	1.46	0.99	0.80	0.20	,	0.33	,	,	,	,	0.68	6.20	1.10
3151	,	,	,	,	,	,	,	,	,	,	,	0.25	0.02
3249	,	,	,	0.20	0.22	,	,	,	,	,	,	,	0.05
3250	25.30	20.50	16.70	14.90	1.30	,	,	,	,	,	5.87	23.10	11.90
3251	,	,	0.20	,	,	,	,	,	,	,	0.23	0.25	0.07
3350	18.40	40.80	28.60	11.70	1.52	,	,	,	,	,	1.13	8.93	12.30
3351	9.83	20.50	14.70	3.98	0.65	,	,	,	,	,	,	2.98	5.85
3847	,	,	0.99	,	,	,	,	,	,	,	,	,	0.12
	91.82	97.16	87.24	60.03	49.06	25.92	10.50	15.00	22.53	44.55	69.56	82.60	65.93
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

* Bloco não identificado,

Table 9 - Monthly percentage distribution of fishing effort (number of fishing days) by 1º x 1º blocks and area for leased baitboats, during the period 1993 - 1996

	MONTHS												TOTAL
BLOCKS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEZ	
*	0.92	0.61	0.54	1.64	0.69	,	,	,	,	,	,	,	0.59
1938	,	,	,	,	,	,	0.58	,	,	,	,	,	0.04
2037	,	,	,	,	,	0.41	1.16	,	,	,	,	,	0.13
2038	,	,	,	,	,	0.41	,	,	,	,	,	,	0.04
2047	,	,	,	0.33	,	,	,	,	,	,	,	,	0.04
2147	,	,	,	,	,	0.41	,	,	,	,	,	,	0.04
2239	,	,	,	,	,	,	0.58	,	,	,	,	,	0.04
2240	,	,	,	,	,	0.82	2.89	,	,	,	,	,	0.30
2247	,	,	,	,	,	0.41	,	,	,	,	,	,	0.04
2340	,	,	,	,	,	1.23	0.58	,	,	,	,	,	0.17
2341	,	,	,	,	0.34	2.47	3.47	,	,	,	,	,	0.55
2342	,	,	,	1.64	1.72	9.47	6.94	,	,	,	,	,	1.90
2343	,	,	0.27	,	,	0.41	1.16	7.69	,	,	,	,	0.21
2344	,	,	,	,	0.34	,	,	,	,	,	,	,	0.04
2345	0.31	,	,	,	,	,	,	,	,	,	0.71	,	0.08
2346	,	,	,	,	,	,	0.58	,	,	,	,	,	0.04
2347	,	,	,	,	0.34	0.41	,	,	,	,	,	,	0.08
2351	,	,	,	,	,	0.41	,	,	,	,	,	,	0.04
	1.23	0.61	0.81	3.61	3.43	16.86	17.94	7.69	-	-	0.71	-	4.37
2443	,	,	,	3.28	1.03	12.80	7.51	7.69	,	,	0.71	,	2.49
2444	1.23	,	,	7.21	1.03	3.70	4.05	,	,	,	0.71	,	1.94
2445	2.76	0.61	0.27	,	,	,	0.58	,	,	,	0.71	,	0.59
2449	,	,	,	,	0.34	,	,	,	,	,	0.71	,	0.08
2543	,	,	,	,	,	,	1.16	,	,	,	,	,	0.08
2544	,	,	,	,	,	0.41	1.16	7.69	,	,	,	,	0.17
2545	0.92	,	0.81	4.26	14.40	6.17	8.09	,	,	,	2.84	2.29	4.13
2546	,	,	0.54	0.98	1.72	,	1.16	,	,	,	,	0.57	0.55
2547	,	,	,	,	0.34	,	,	,	,	,	,	,	0.04
2549	,	,	,	,	0.34	,	,	,	,	,	,	,	0.04
2642	,	,	,	,	,	0.41	,	,	,	,	,	,	0.04
2643	,	,	,	,	,	,	0.58	,	,	,	,	,	0.04
2644	,	,	,	,	,	,	0.58	,	,	,	,	,	0.04
2645	,	,	,	,	1.03	0.41	0.58	,	,	,	,	,	0.21
2646	0.31	0.31	,	2.30	6.87	8.23	6.94	46.20	,	,	1.42	1.14	2.99
2647	1.53	,	0.81	1.31	0.34	0.82	,	,	,	,	,	0.57	0.67
2648	,	,	,	,	0.34	,	,	,	,	,	,	,	0.04
2728	,	,	,	,	,	,	,	,	,	,	0.71	,	0.04
2740	,	,	,	,	0.34	,	,	,	,	,	,	,	0.04
2741	,	,	,	,	0.34	,	,	,	,	,	,	,	0.04
2743	,	,	,	,	,	0.41	,	,	,	,	,	,	0.04
2746	0.31	,	0.81	1.31	6.87	6.17	7.51	23.10	,	,	2.13	0.57	2.66
2747	0.92	,	2.16	8.52	7.90	11.10	6.94	,	,	,	4.96	0.57	4.51
2748	,	0.92	0.54	,	1.03	0.41	,	,	100.00	100.00	0.71	0.57	0.76
	7.98	1.84	5.94	29.17	44.26	51.04	46.84	84.68	100.00	100.00	15.61	6.28	22.23
2842	,	,	,	0.33	0.34	0.41	,	,	,	,	,	,	0.13
2843	,	,	,	,	,	0.41	,	,	,	,	,	,	0.04
2844	0.31	,	,	,	,	,	,	,	,	,	,	,	0.04
2845	,	,	,	,	,	,	,	,	,	,	,	0.57	0.04
2846	,	,	,	0.33	0.34	0.82	,	,	,	,	,	0.57	0.21
2847	2.15	2.45	9.97	22.00	33.00	23.50	33.50	7.69	,	,	22.70	4.00	15.60
2848	0.61	,	2.70	0.66	1.37	,	0.58	,	,	,	,	0.57	0.84
2849	,	,	0.27	0.33	,	,	,	,	,	,	,	,	0.08
2947	,	,	2.96	0.98	2.41	2.47	0.58	,	,	,	2.84	,	1.35
2948	,	0.61	7.55	1.97	4.12	2.88	0.58	,	,	,	7.09	2.86	2.99
2949	0.31	0.31	,	0.33	,	,	,	,	,	,	,	,	0.13
3047	0.61	,	,	,	,	,	,	,	,	,	0.71	,	0.13
3048	4.60	2.14	2.70	7.21	4.47	1.23	,	,	,	,	28.40	10.90	5.44
3049	2.15	3.06	0.27	0.98	0.69	,	,	,	,	,	2.84	7.43	1.69
3144	,	0.31	,	,	,	,	,	,	,	,	,	,	0.04
3148	,	,	,	,	,	,	,	,	,	,	0.71	,	0.04
3149	3.68	5.20	7.82	2.62	1.03	,	,	,	,	,	5.67	16.60	4.47
3150	1.23	3.36	1.62	1.31	0.69	0.41	,	,	,	,	1.42	2.29	1.43
3151	,	,	,	,	0.34	,	,	,	,	,	,	,	0.04
3247	,	,	,	,	,	,	,	,	,	,	,	0.57	0.04
3249	,	0.31	0.27	,	,	,	,	,	,	,	0.71	,	0.13
3250	30.70	20.80	15.40	9.18	2.06	,	,	,	,	,	8.51	32.00	13.80
3251	,	0.31	1.08	,	,	,	,	,	,	,	,	,	0.21
3349	,	0.31	,	,	,	,	,	,	,	,	,	,	0.04
3350	38.00	24.80	20.80	10.50	0.34	,	,	,	,	,	1.42	12.00	14.20
3351	5.52	31.80	19.40	8.52	0.34	,	,	,	,	,	,	3.43	9.57
3352	,	,	0.27	,	,	,	,	,	,	,	,	,	0.04
3357	,	,	0.27	,	,	,	,	,	,	,	,	,	0.04
3449	,	0.31	,	,	,	,	,	,	,	,	,	,	0.04
3451	0.92	0.61	,	,	,	,	,	,	,	,	,	,	0.21
3550	,	0.92	,	,	,	,	,	,	,	,	,	,	0.13
3648	,	,	,	,	0.34	,	,	,	,	,	,	,	0.04
3847	,	,	,	,	,	,	,	,	,	,	0.71	,	0.04
3951	,	,	,	,	0.34	,	,	,	,	,	,	,	0.04
	90.79	97.61	93.35	67.25	52.22	32.13	35.24	7.69	-	-	83.73	93.79	73.30
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

* Bloco não identificado,

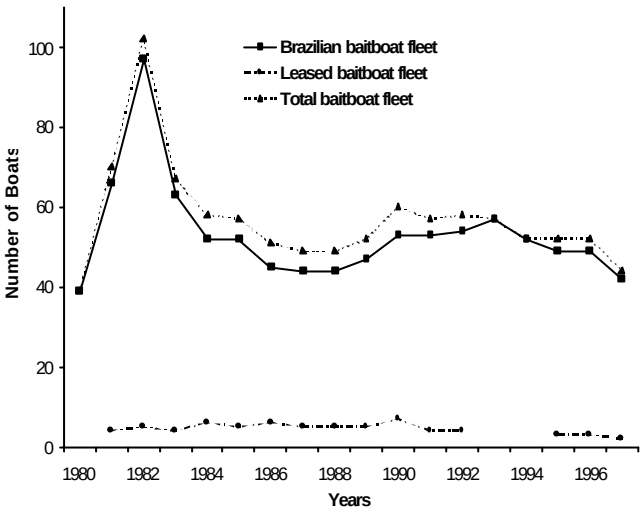


Fig. 1 - Number of Brazilian and Japanese flagged leased baitboats operating in Brazilian waters during the period 1980 - 1997.

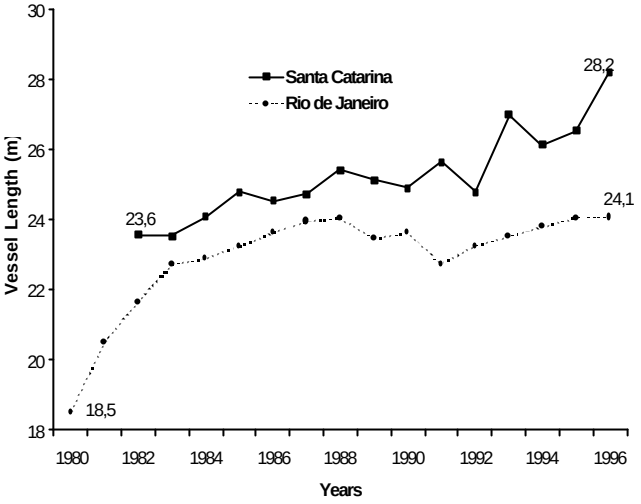


Fig . 2 - Annual change in average vessel length of the Brazilian baitboat fleet basead at Rio de Janeiro and Santa Catarina, during the period 1980 - 1996.

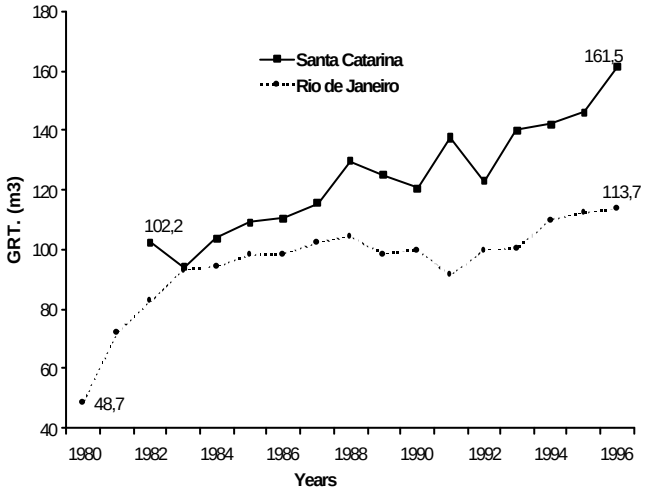


Fig. 3 - Annual change in average gross registered tonnage (GRT) of the Brazilian baitboat fleet based at Rio de Janeiro and Santa Catarina, during the period 1980 - 1996.

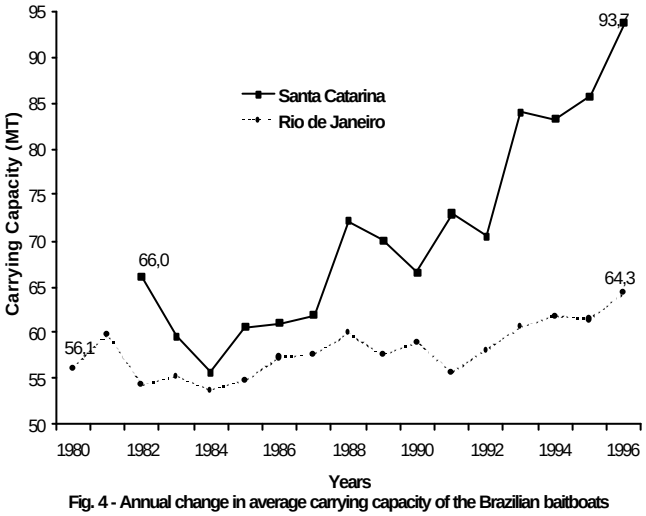


Fig. 4 - Annual change in average carrying capacity of the Brazilian baitboats based at Rio de Janeiro and Santa Catarina, during the period 1980 - 1996.

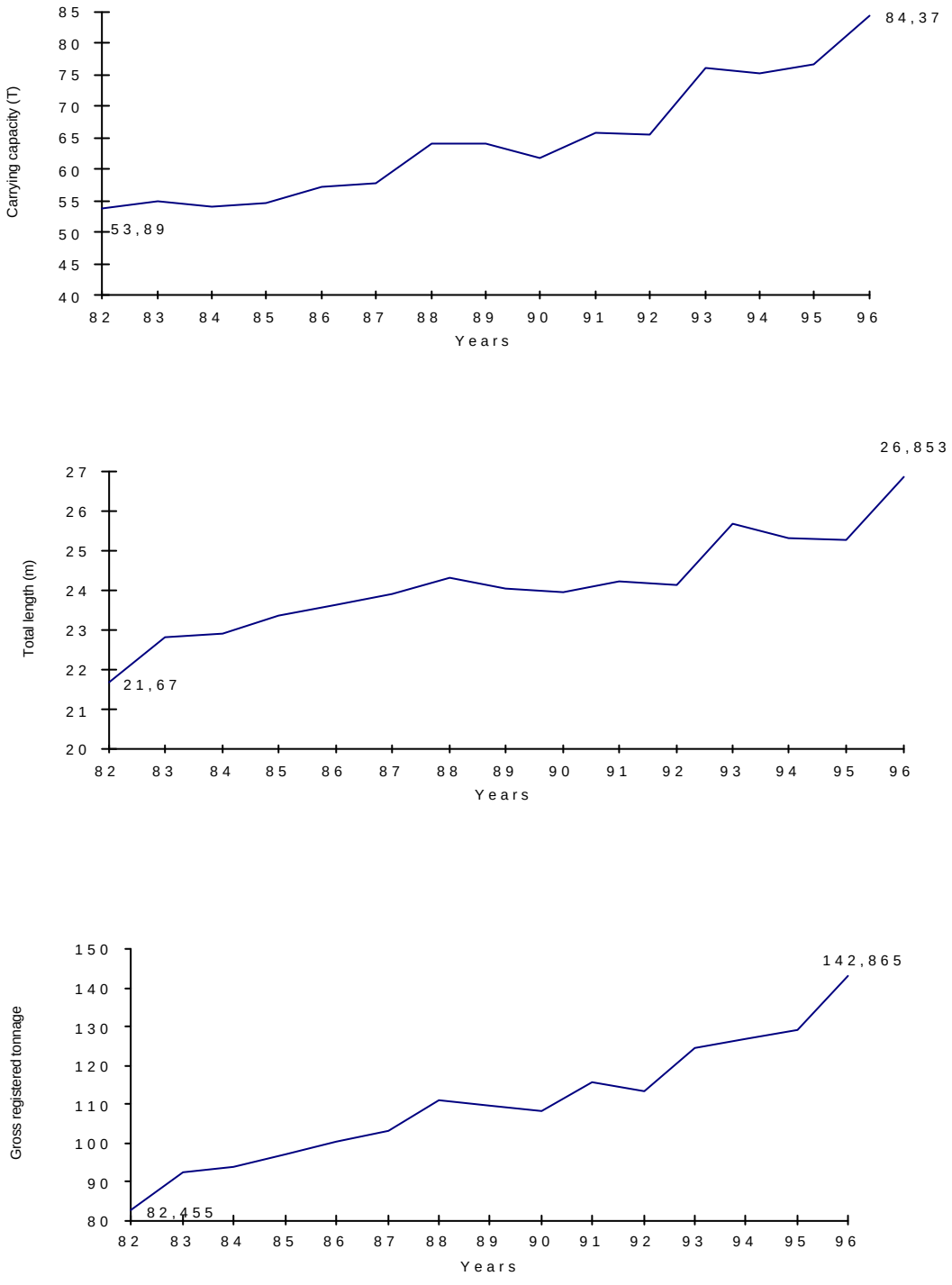


Fig. 5 – Annual change in average vessel characteristics of the Brazilian baitboat fleet (Rio de Janeiro and Santa Catarina combined), over the years 1982-1996. (A) - Carrying capacity; (B) – Total length and (C) – Gross registered tonnage.

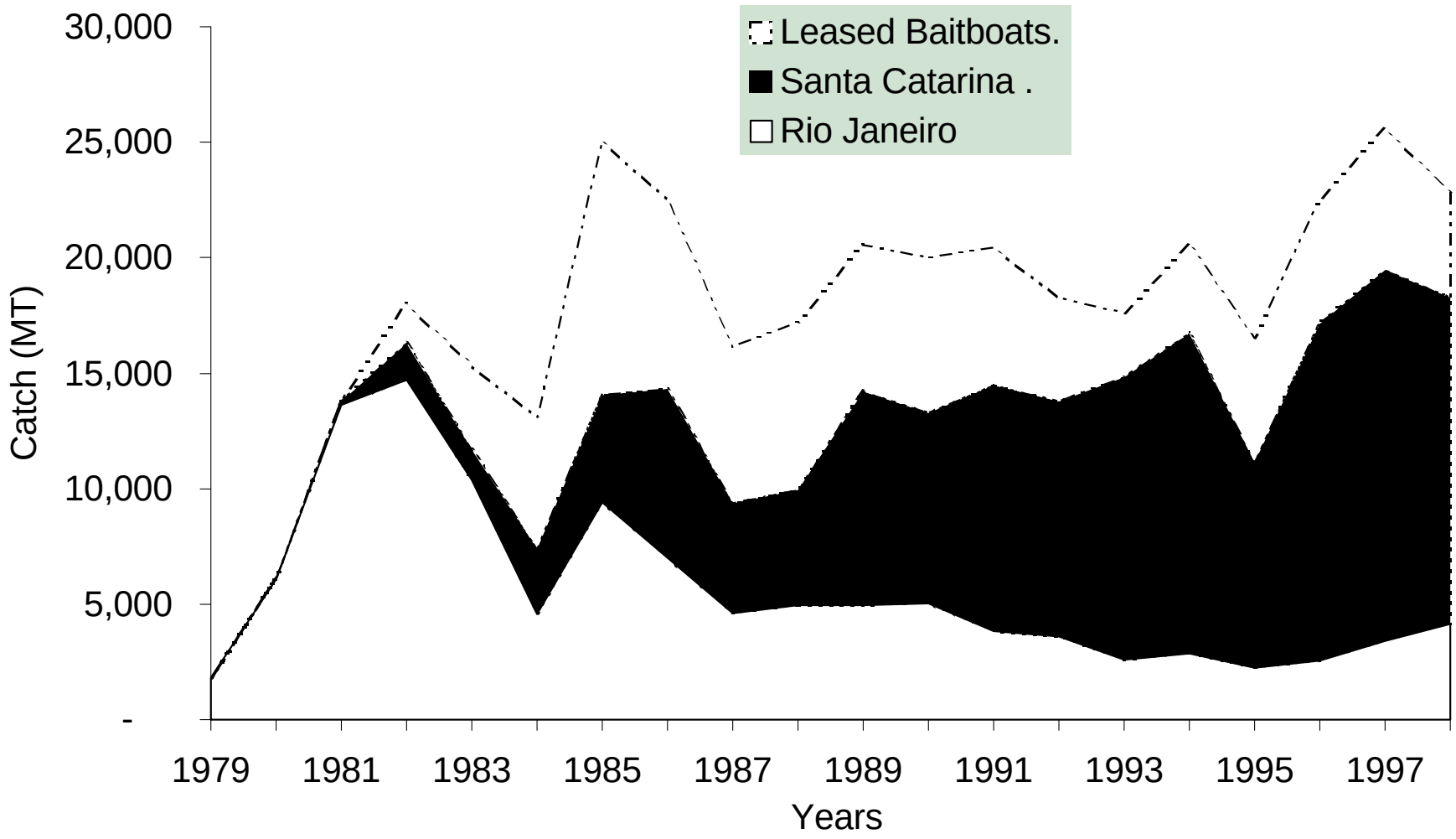


Fig. 6 Accumulative skipjack annual catches by Brazilian and foreign flagged leased baitboats, during the period 1979 -1998

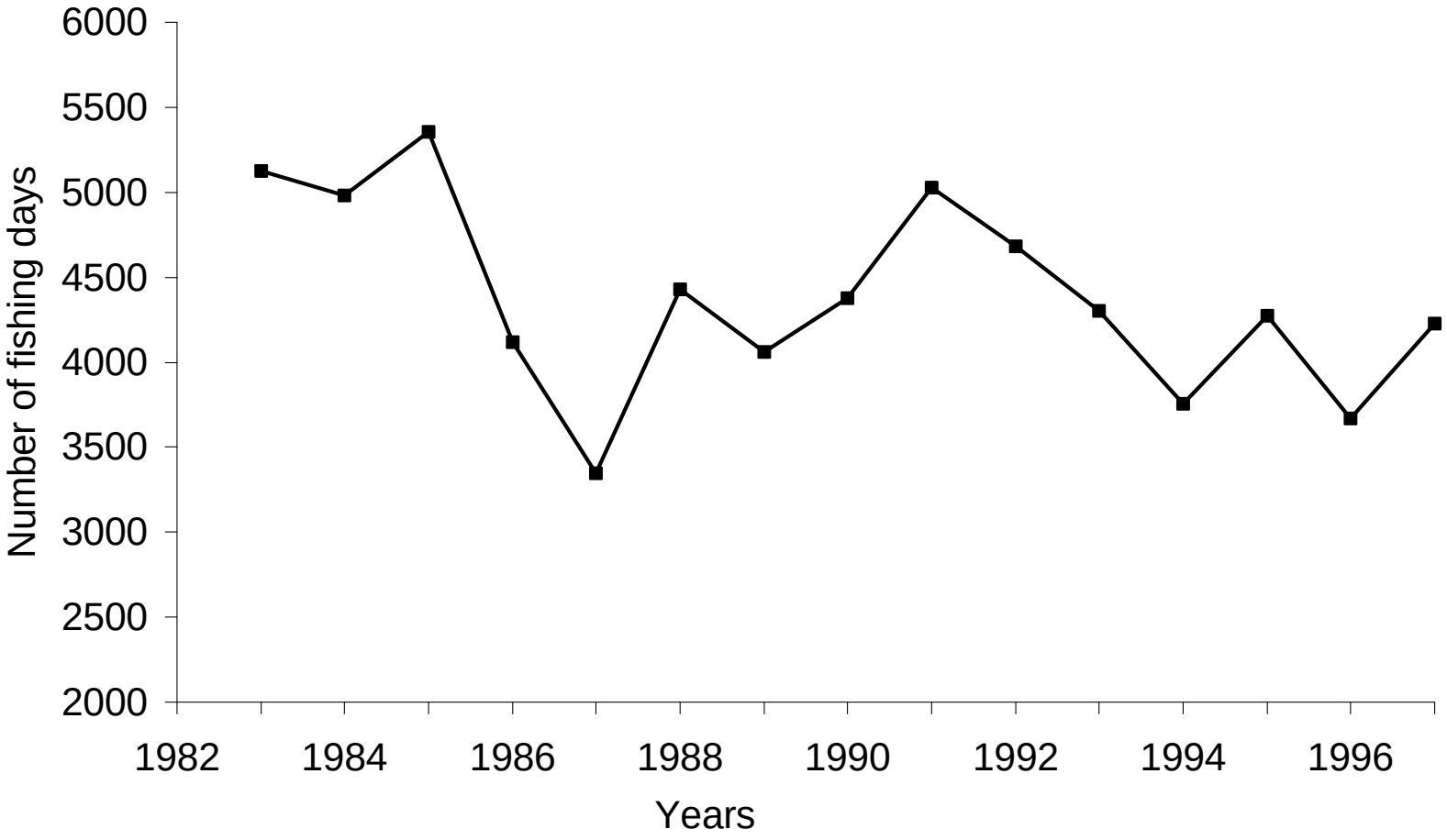


Fig. 7- Historical development of nominal fishing effort (number of fishing days), by all baitboat fleets, in the south and southeast regions of Brazil, during the period 1983 - 1997.

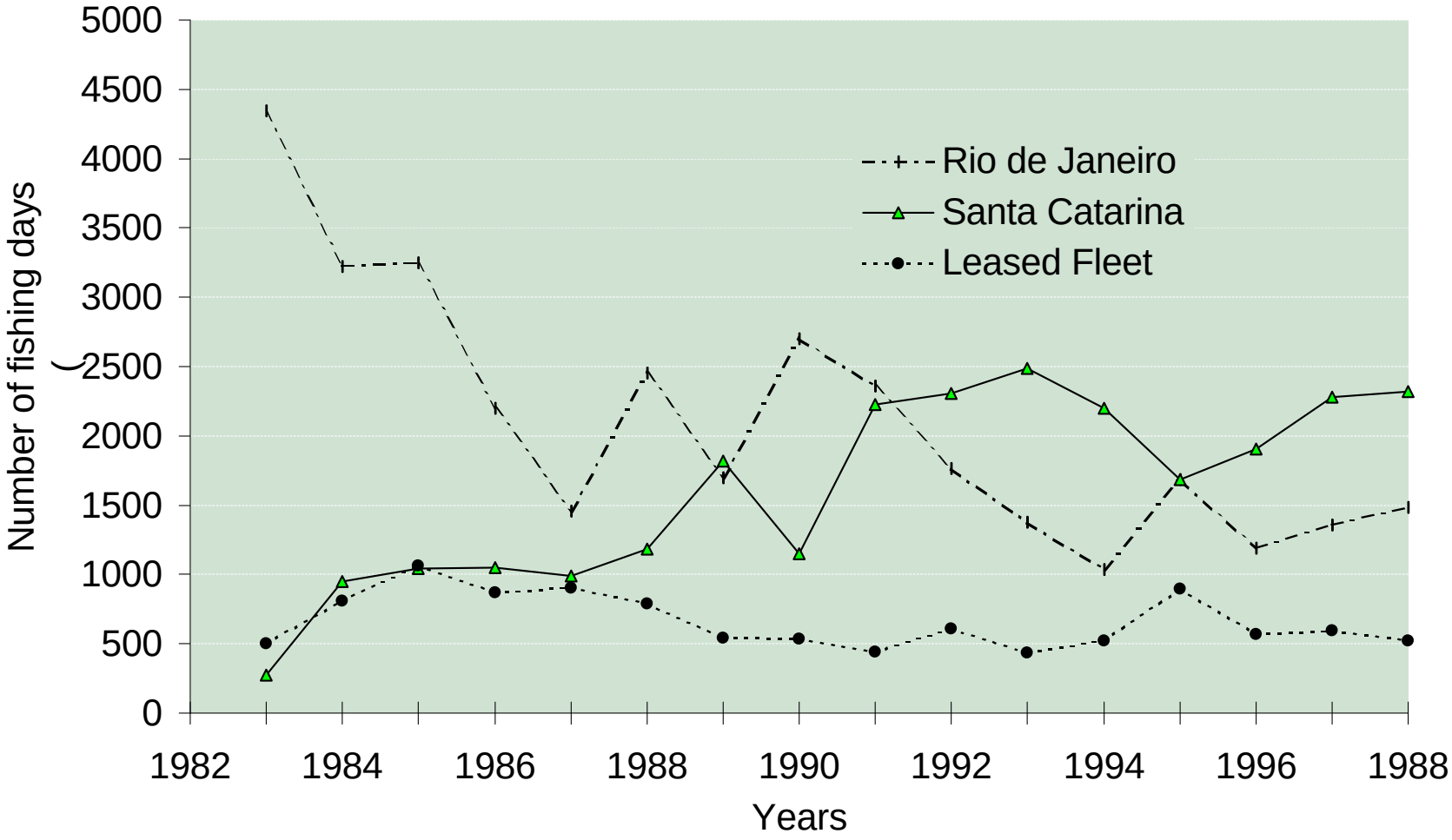


Fig. 8 - Historical development of nominal fishing effort (number of fishing days) by each baitboat fleet (National and Japanese flagged leased baitboats), during the period 1983 - 1998.

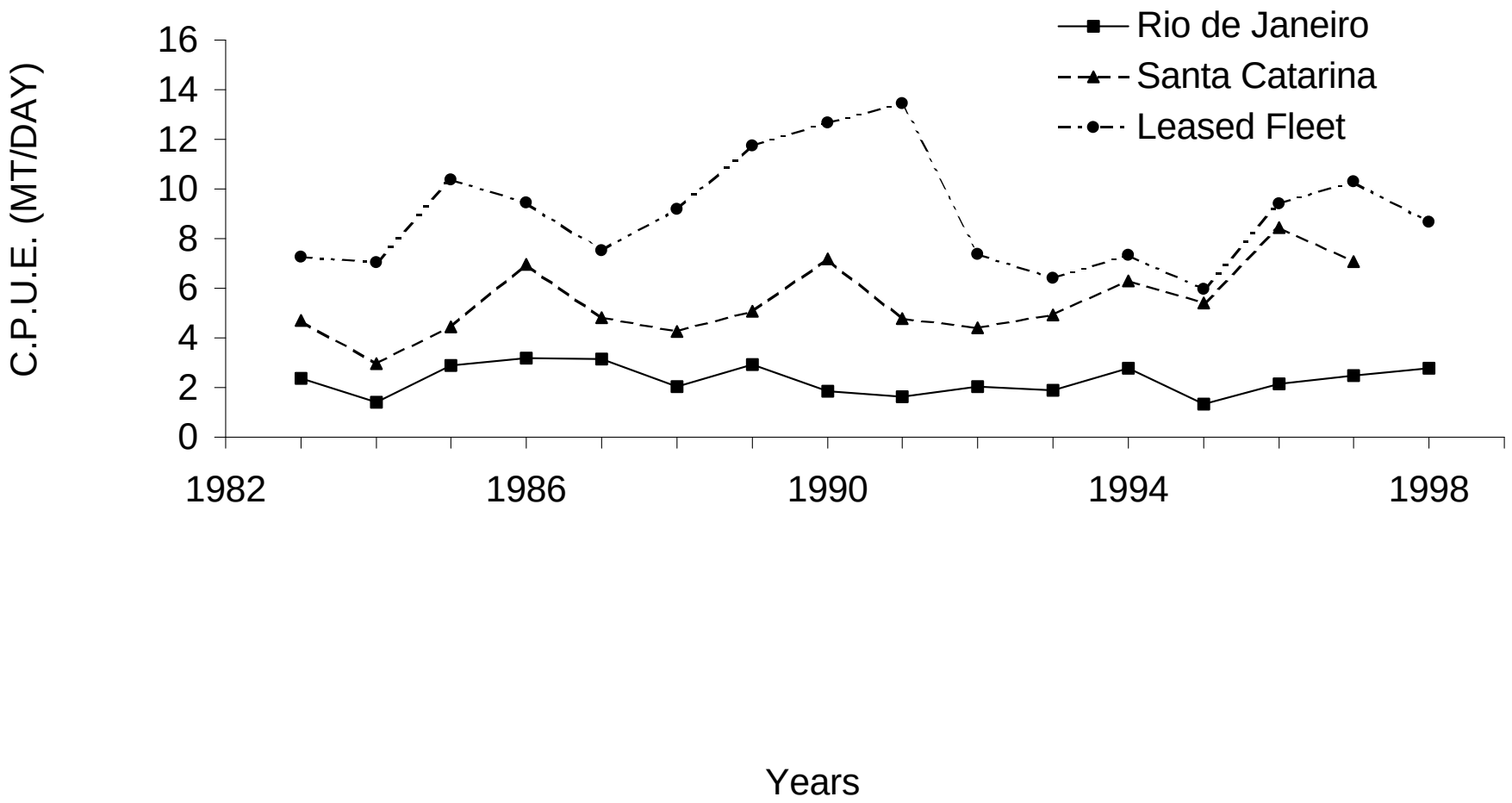


Fig. 9 - Nominal CPUE trends for skipjack, by each baitboat fleet, during the period 1983 - 1998.

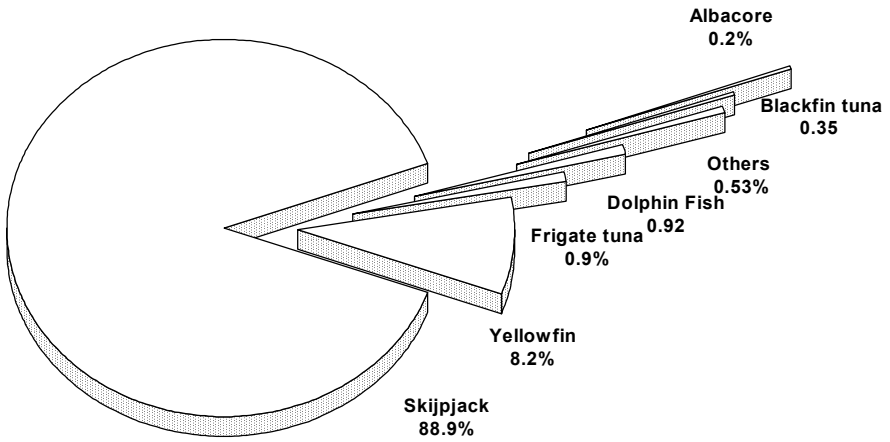


Fig. 10 - Average species composition (%) of catches by all baitboat fleet, in the south and southeast regions of Brazil, during the period 1983 - 1996.

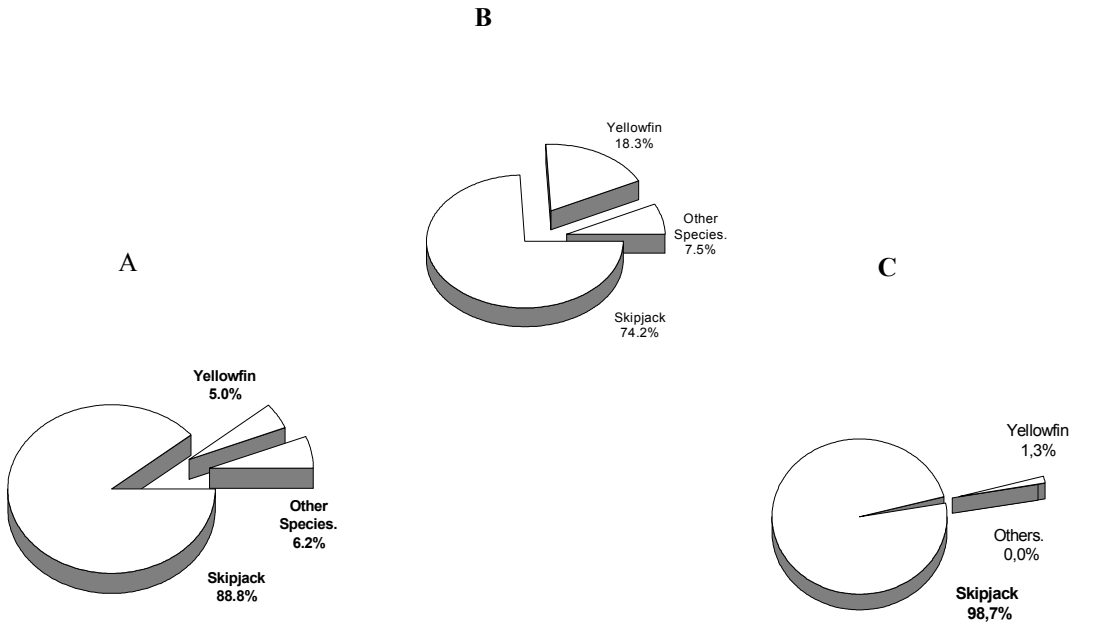


Fig. 11 - Average species composition of catches by each baitboat fleet, in the south and southeast regions of Brazil, during the period 1983 - 1996. A = Santa Catarina; B = Rio de Janeiro; C = Leased Fleet.

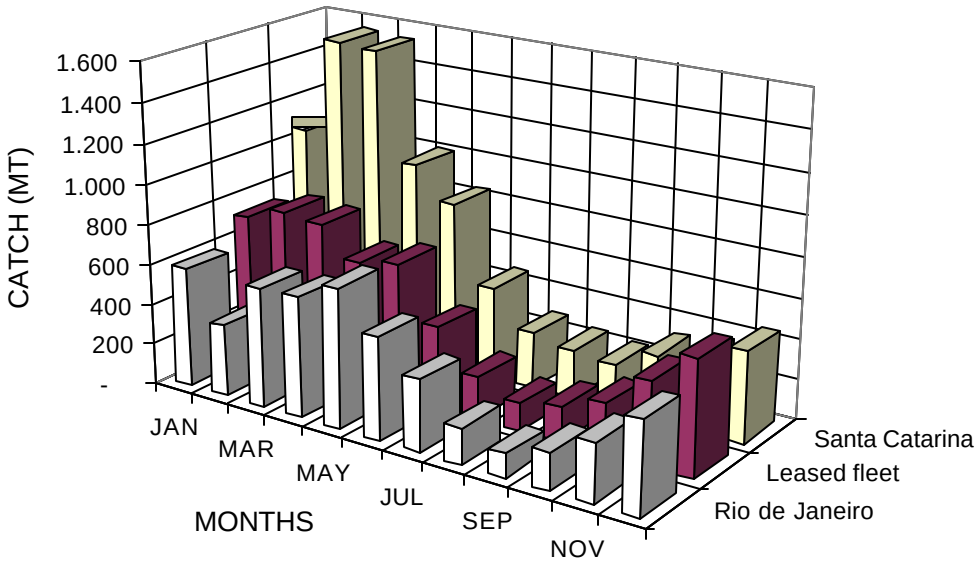


Fig. 12 Monthly skipjack catch (MT), by each baitboat fleet, in the southeastern region of Brazil, during the period 1983-1996

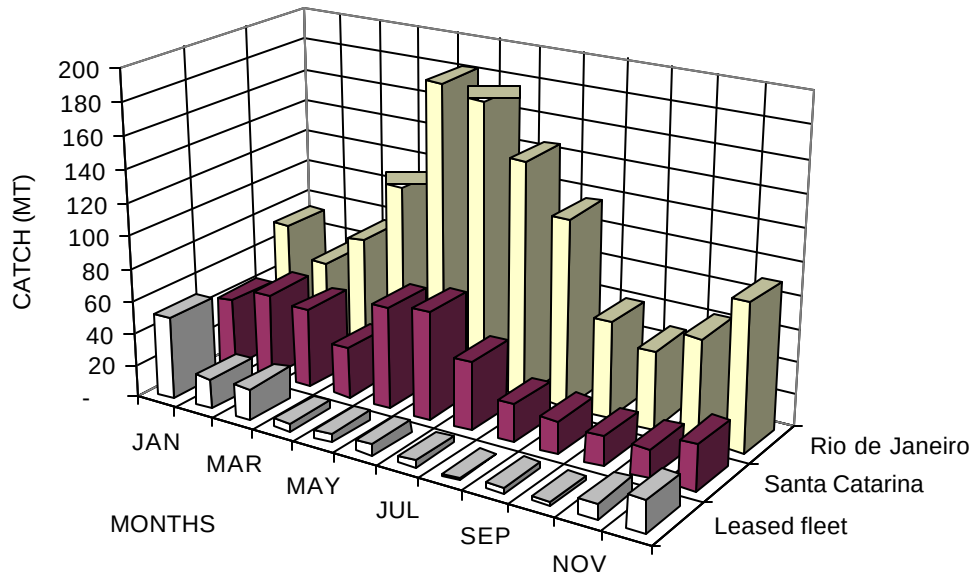


FIG. 13 - Monthly yellowfin catch by each baitboat fleet, in the souteastern region of Brazil, during the period 1983-1996

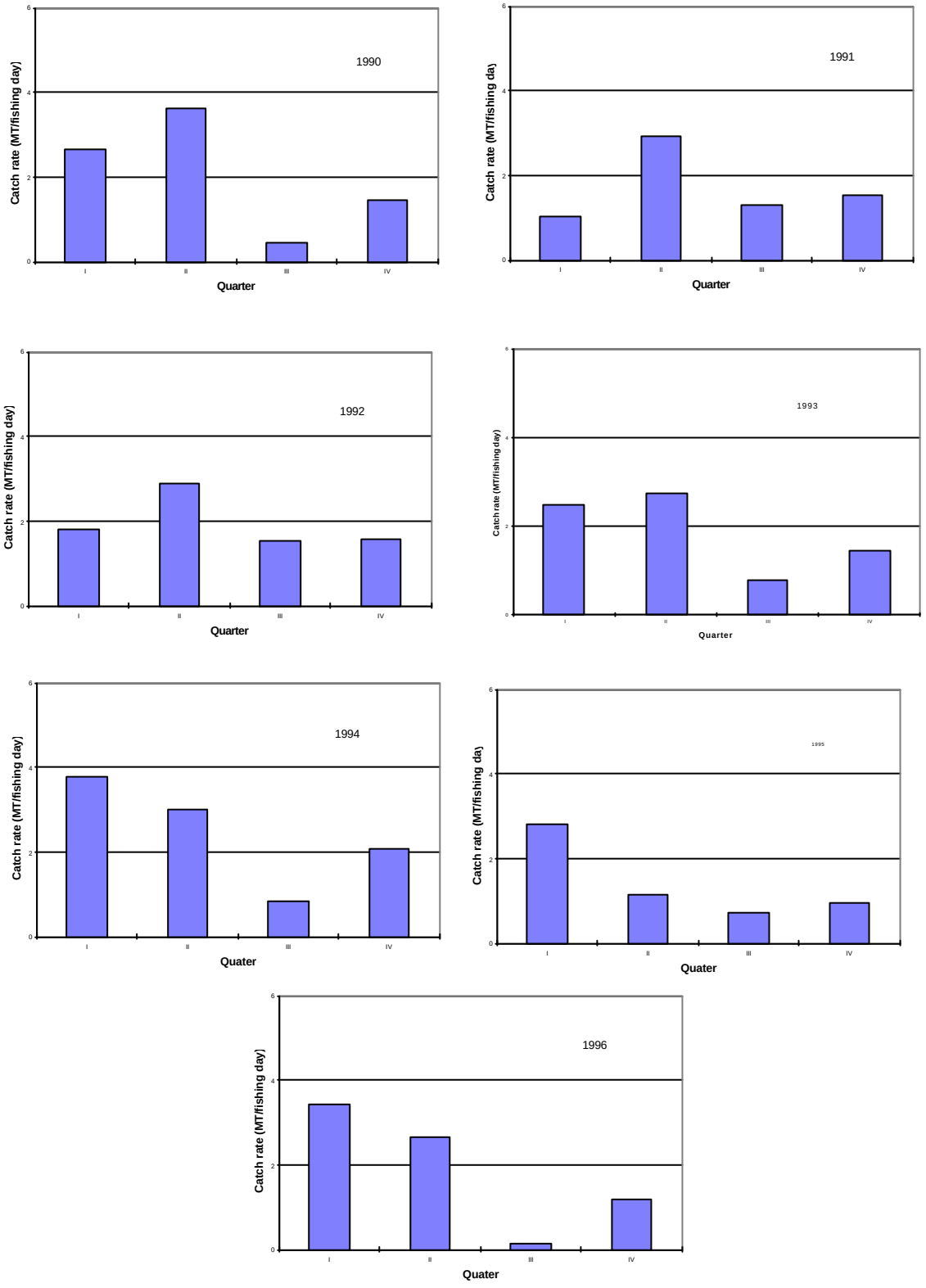


Fig 14 a. **Mean skipjack CPUE (MT/fishing day) by year for the Rio de Janeiro based fleet, 1990-1996**

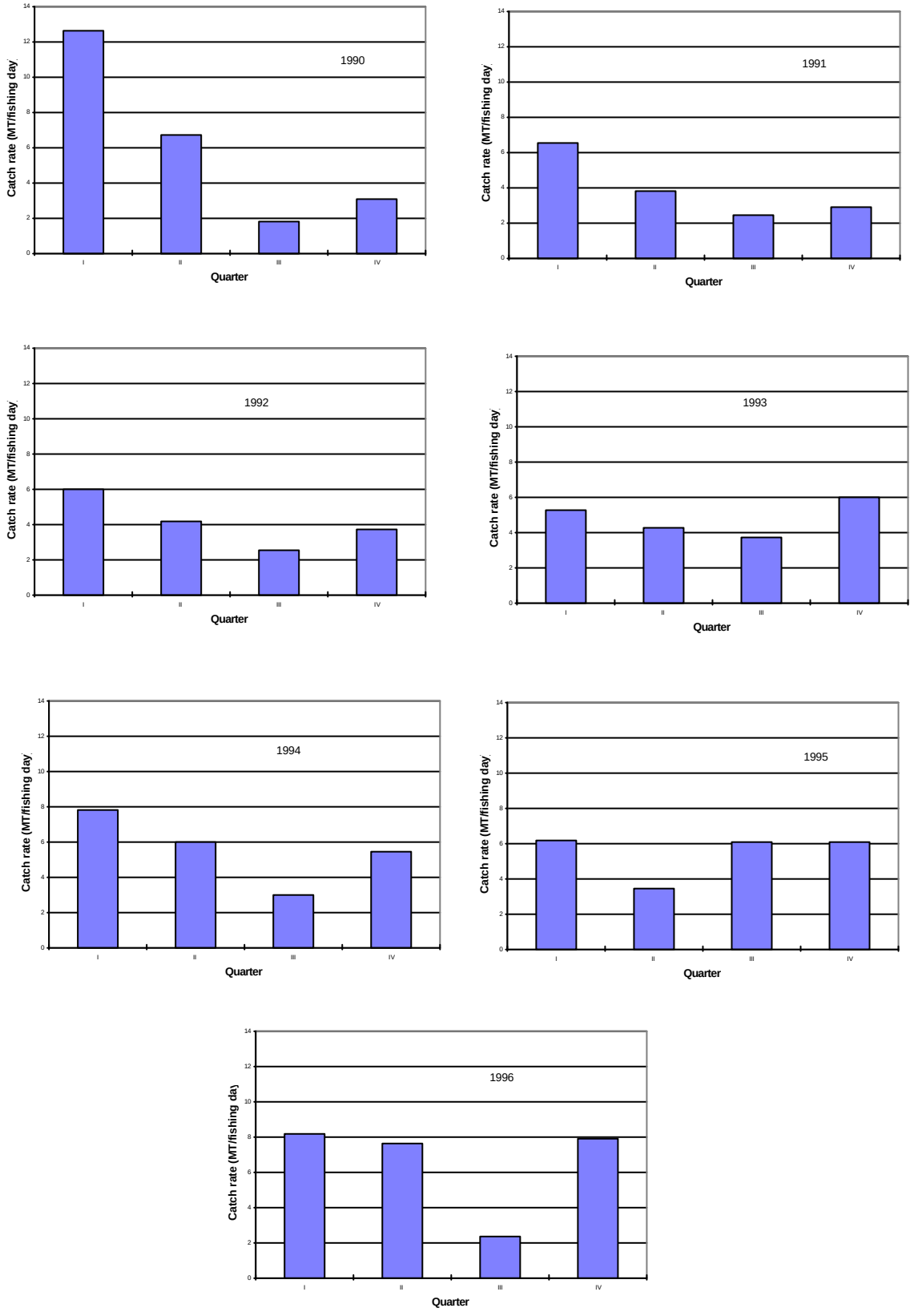


Fig 14 b. **Mean skipjack CPUE (MT/fishing day) by year and quarter for the baitboat fleet based at Santa Catarina, 1990-1996.**

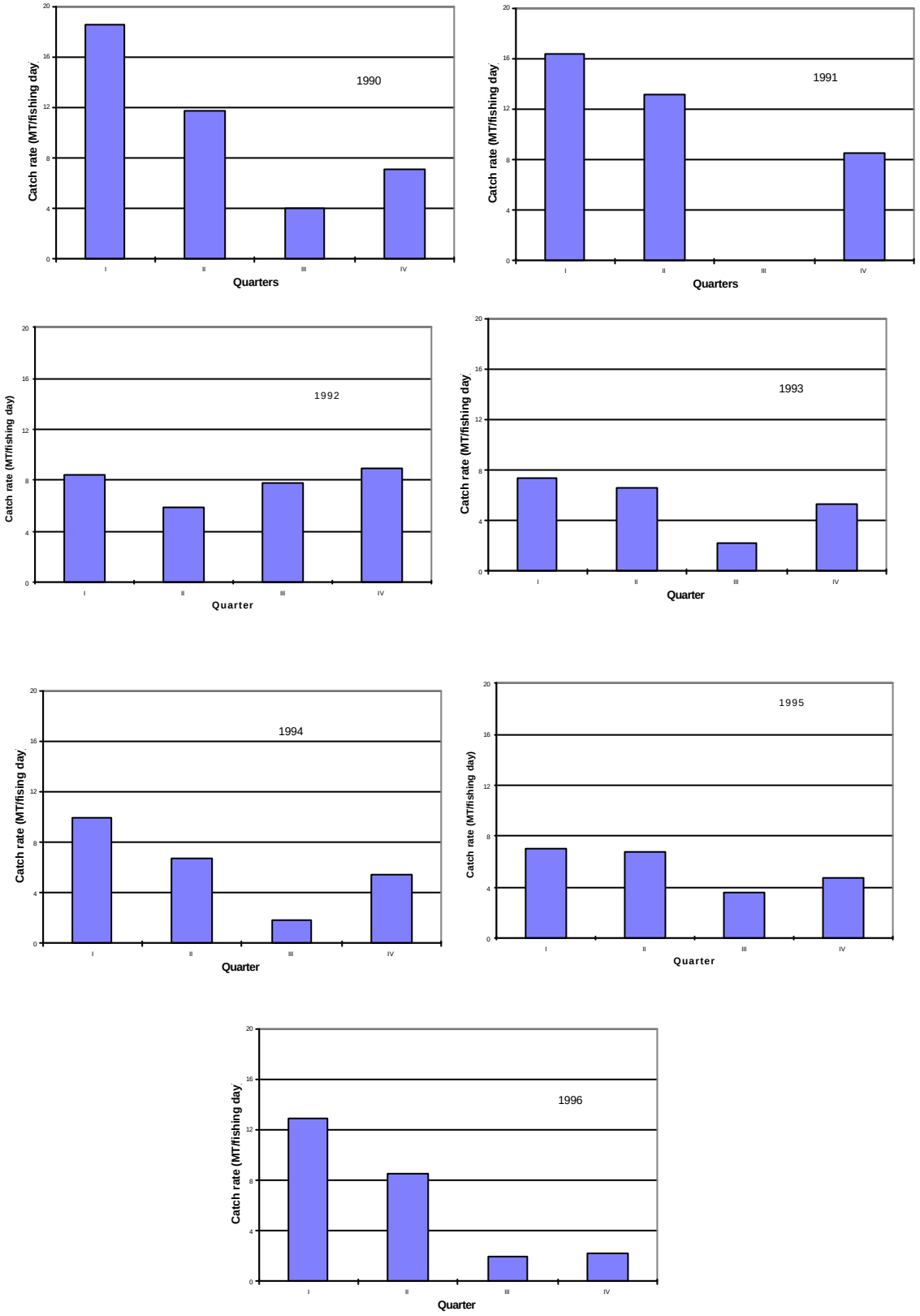


Fig. 14.c Mean skipjack CPUE (MT/Fishing day) by year and quarter for the leased baitboat fleet, 1990-1996

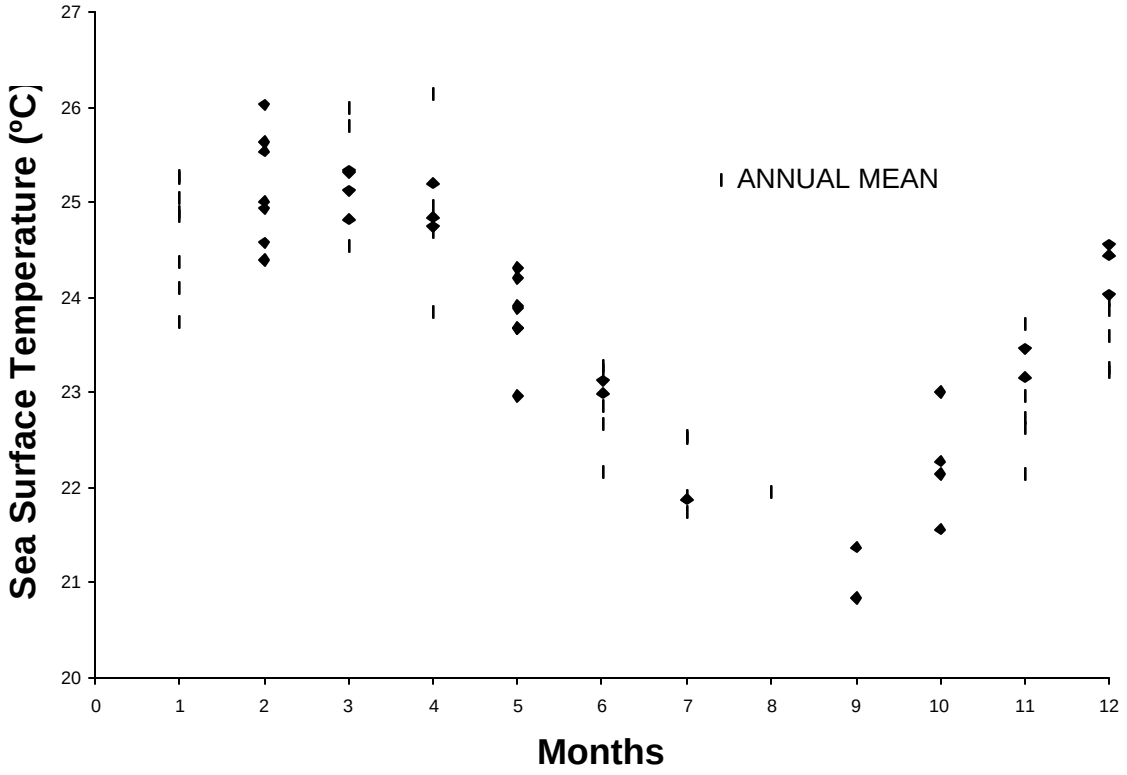


Fig 15- Monthy change in average sea surface temperature (ºC), from data collected through logbooks from fishermen of foreign flagged leased baitboats, during the period 1989 - 1996

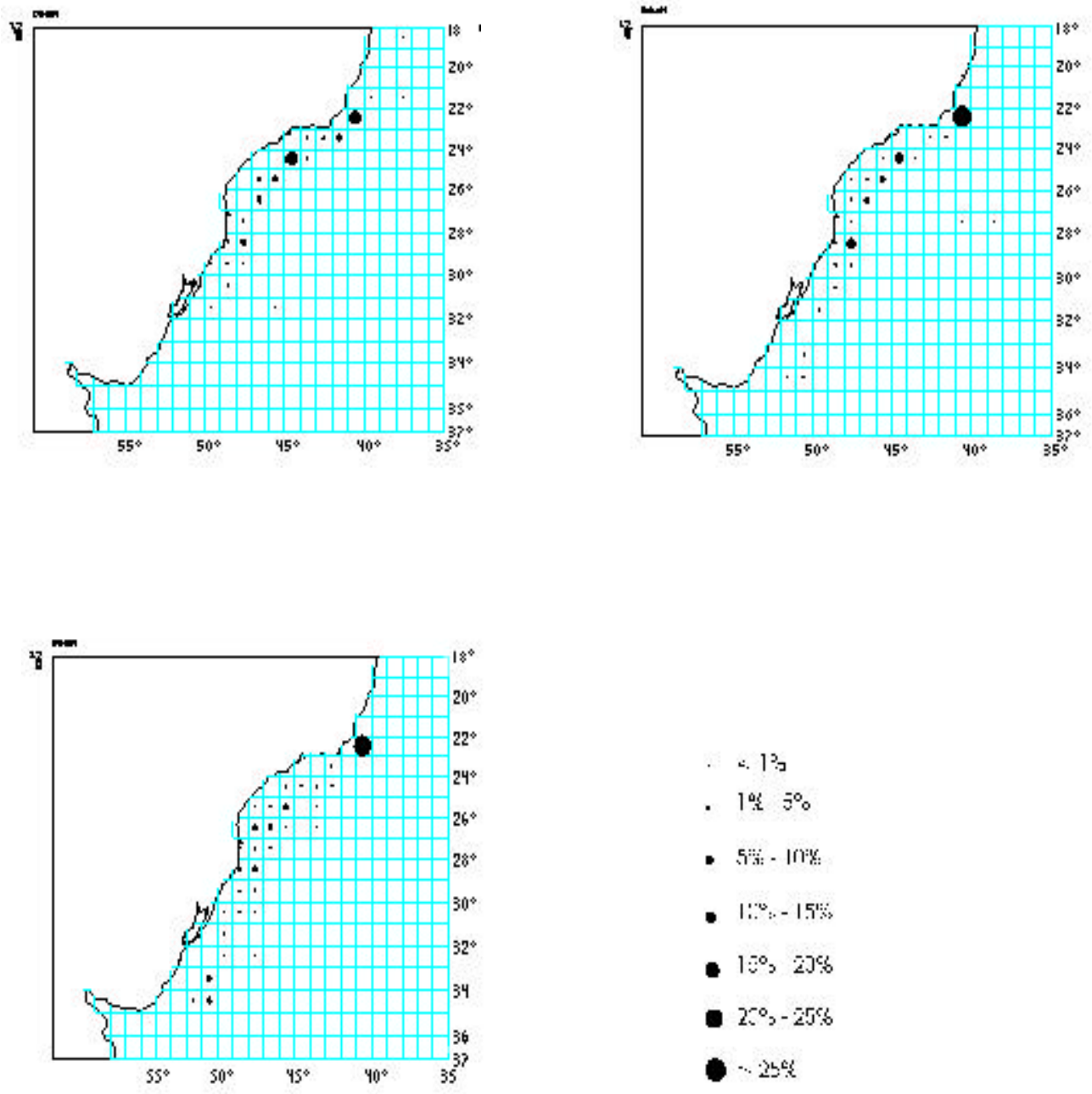
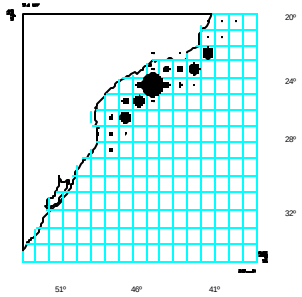
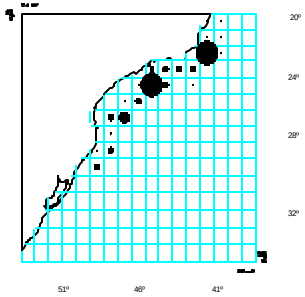
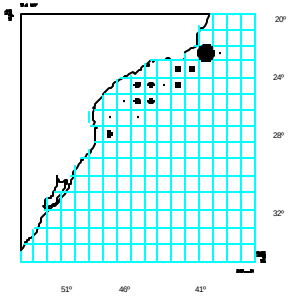


Fig. 16 - Geographical Distribution of average fishin effort (number of fishing days) in percentage for all fleets combined, during each time period.

A







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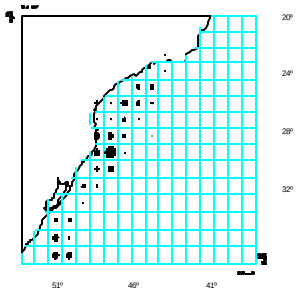

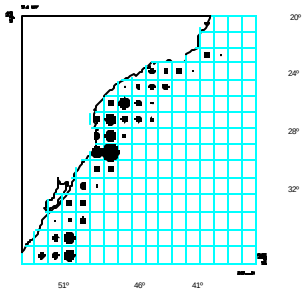

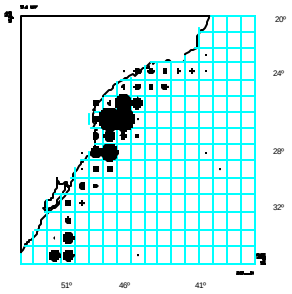

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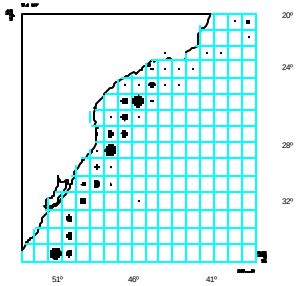
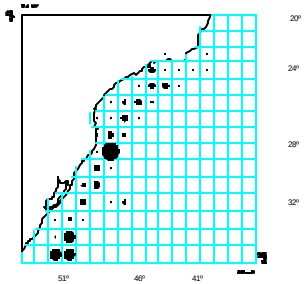
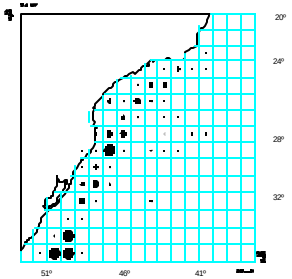




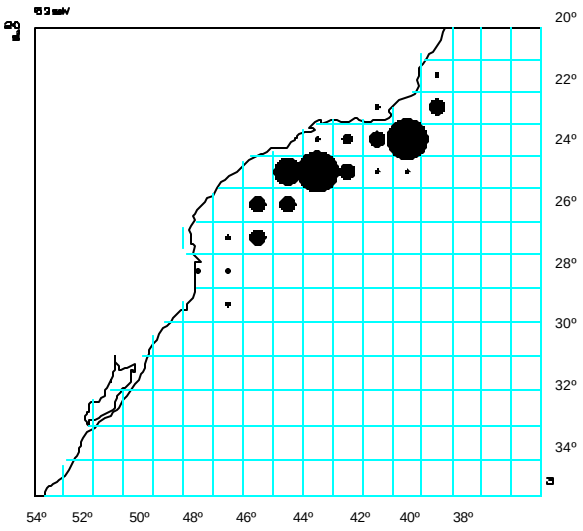


1983 - 1985

1986 - 1992

1993 - 1996

Fig. 17 - Geographical distribution of average annual skipjack catch (MT), by each baitboat fleet and time period. A = Rio de Janeiro based fleet, B = Santa Catarina based fleet, C = Leased fleet



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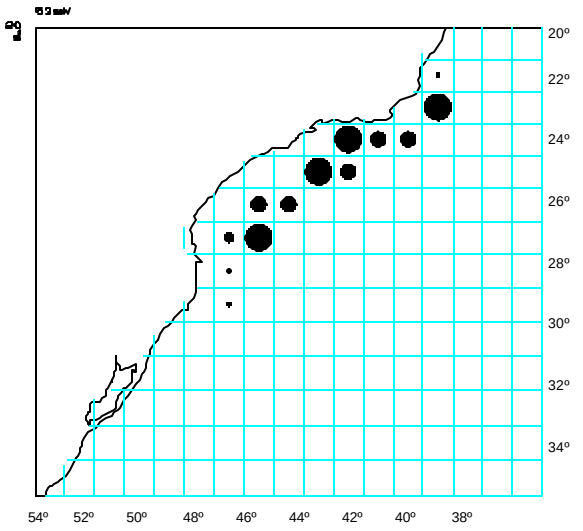

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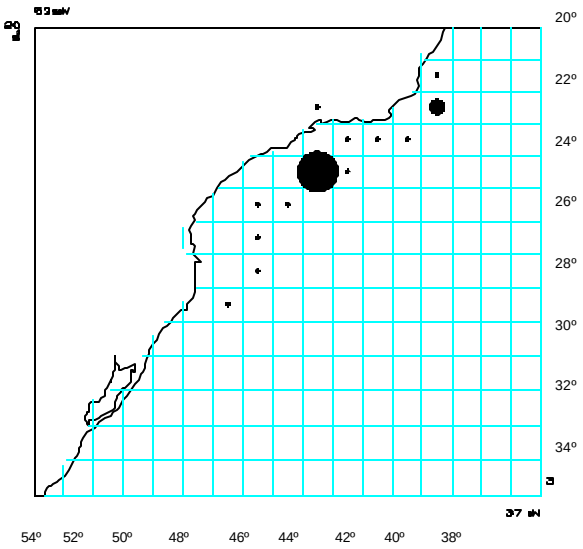

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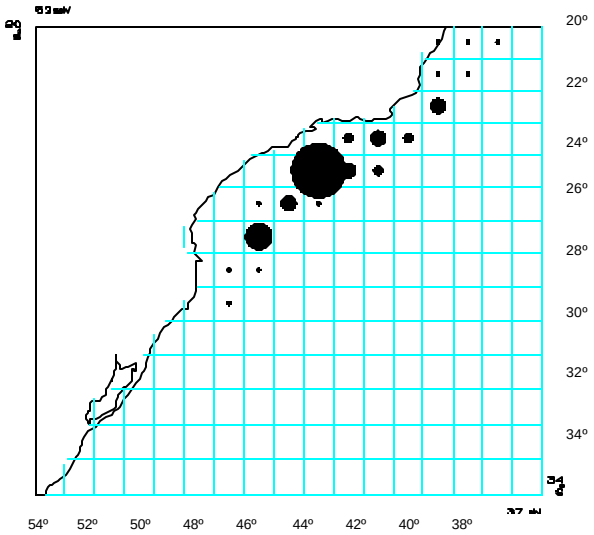

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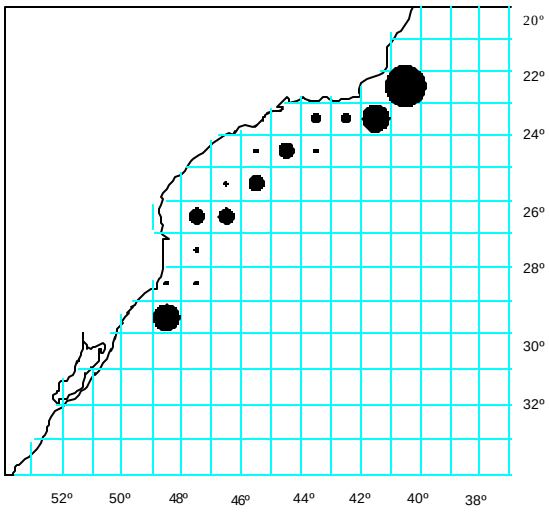
Fig. 18 - Geographical distribution of skjpjack catch (MT), by quarter, in the Brazilian baitboat fishery from Rio de Janeiro, during the period 1983 - 1985



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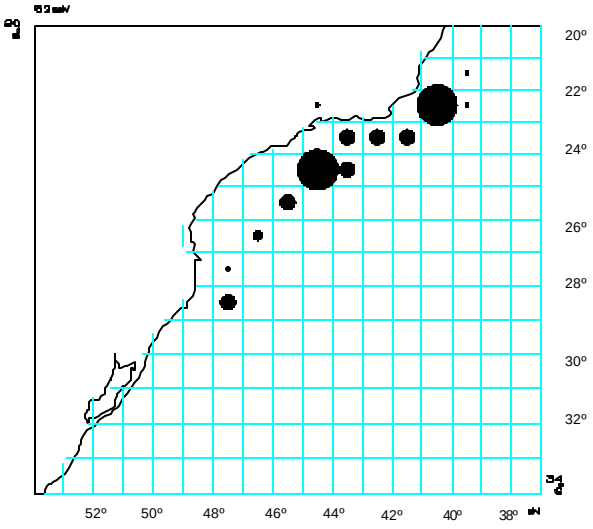

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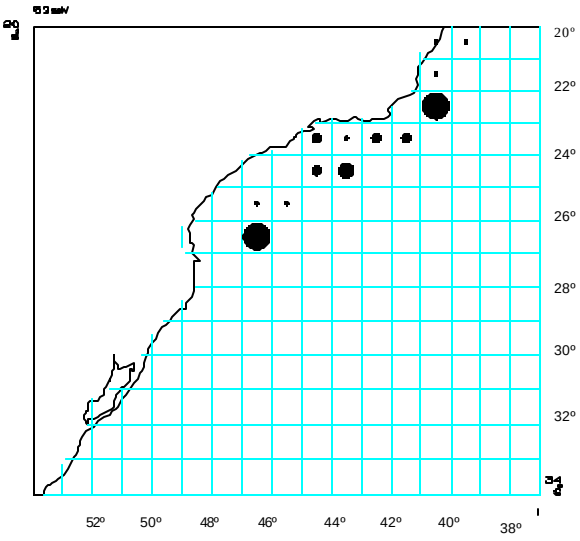

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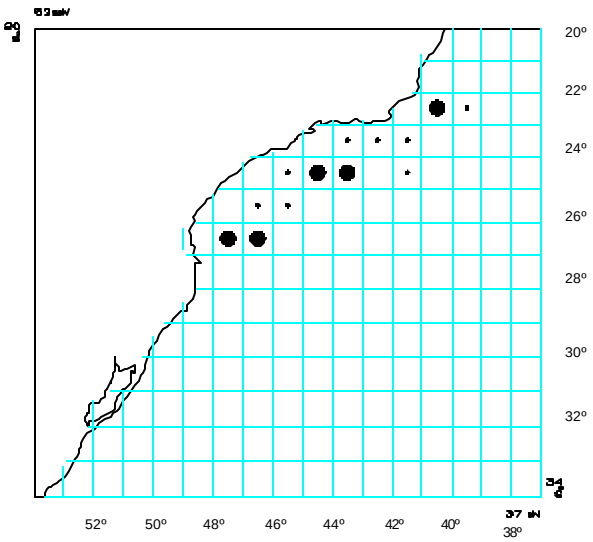

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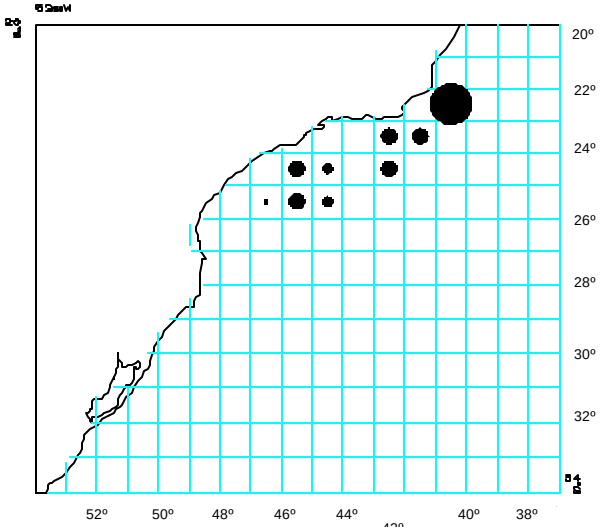
Fig. 19 - Geographical distribution of skjpjack catch (MT), by quarter, in the Brazilian baitboat fishery from Rio de Janeiro, during the period 1986 - 1992



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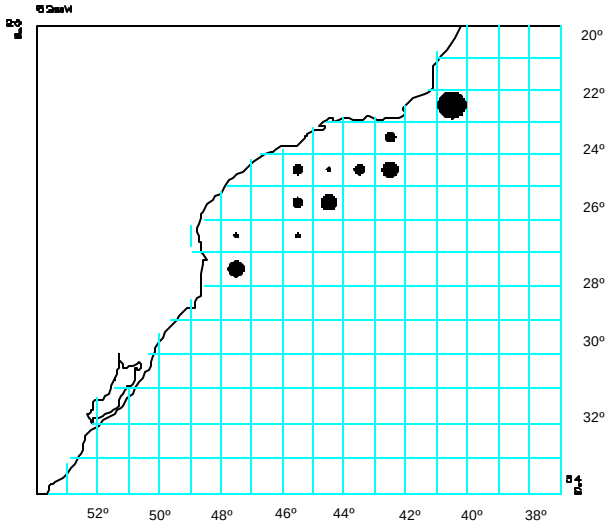

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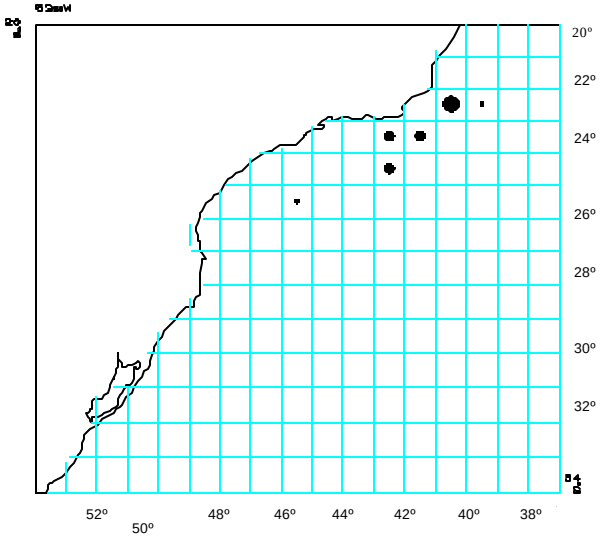

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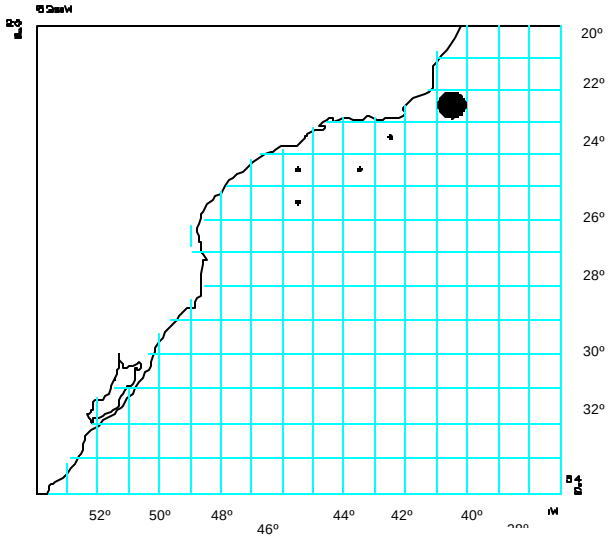

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Fig. 20 - Geographical distribution of skipjack catch (MT), by quarter, in the Brazilian baitboat fishery from Rio de Janeiro, during the period 1993 - 1996

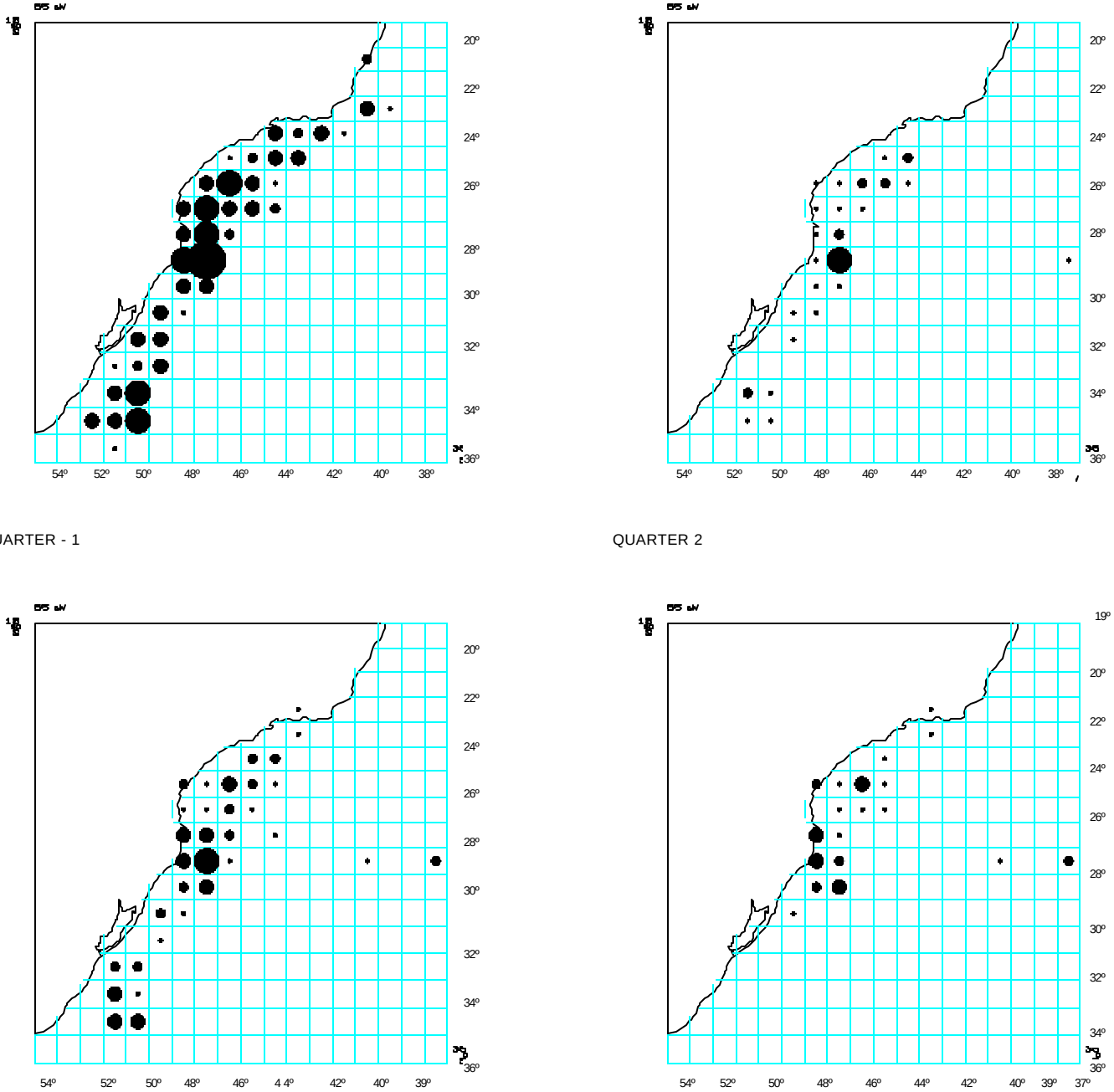
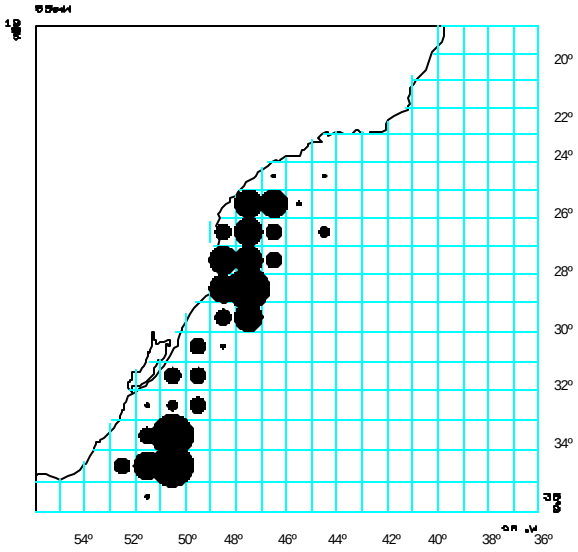


Fig. 21 - Geographical distribution of skipjack catch (MT), by quarter, in the Brazilian baitboat fishery from Santa Catarina, during the period 1983 - 1985



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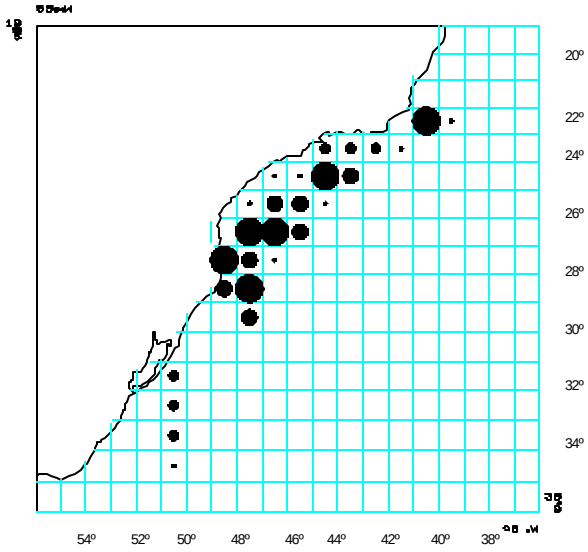

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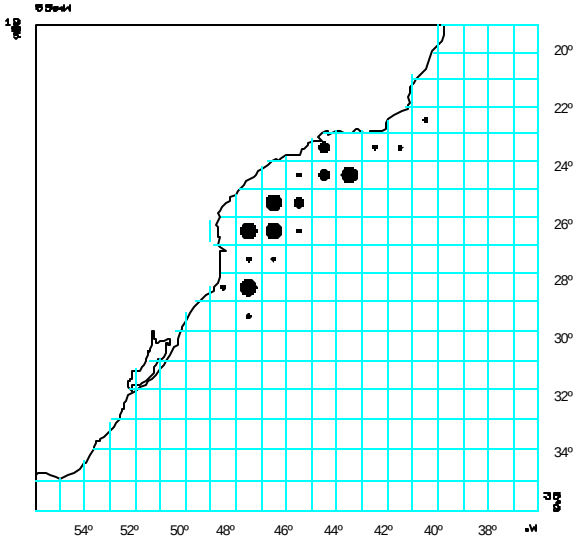

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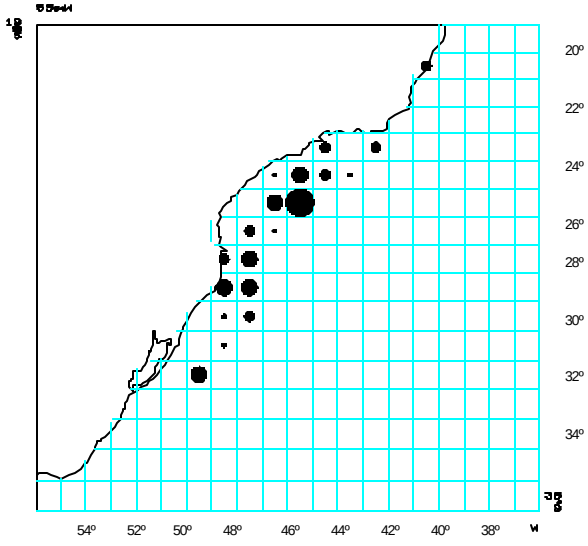

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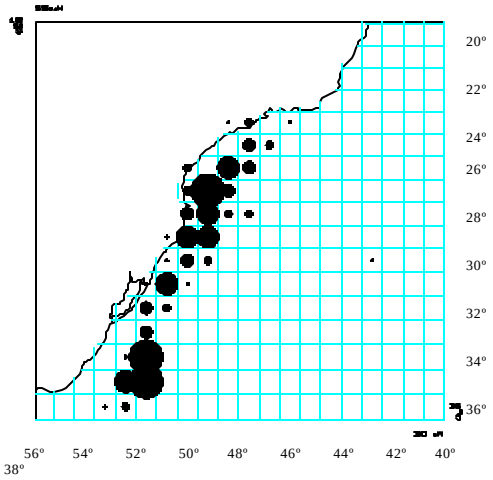
Fig. 22 - Geographical distributin of skipjack catch (MT), by quarter, in the Brazilian baitboat fishery from Santa Catarina, during the period 1986 - 1992



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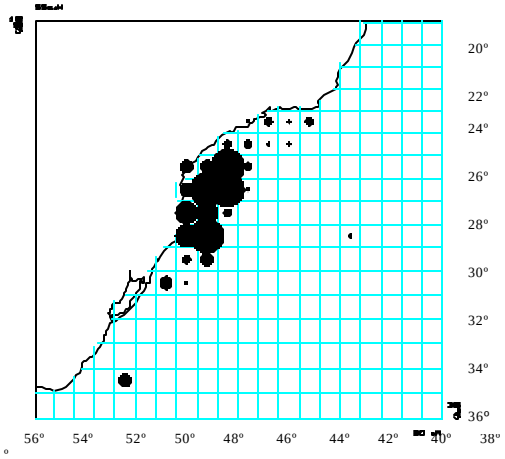

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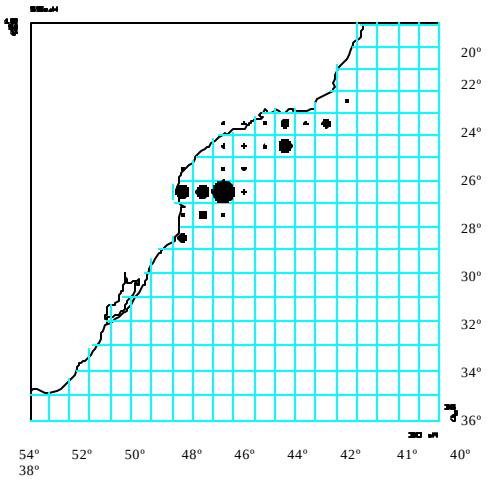

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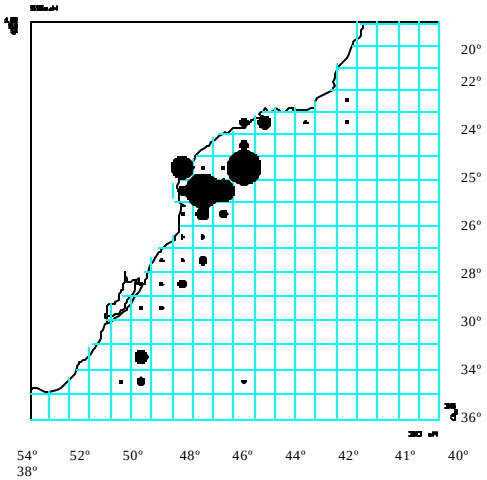

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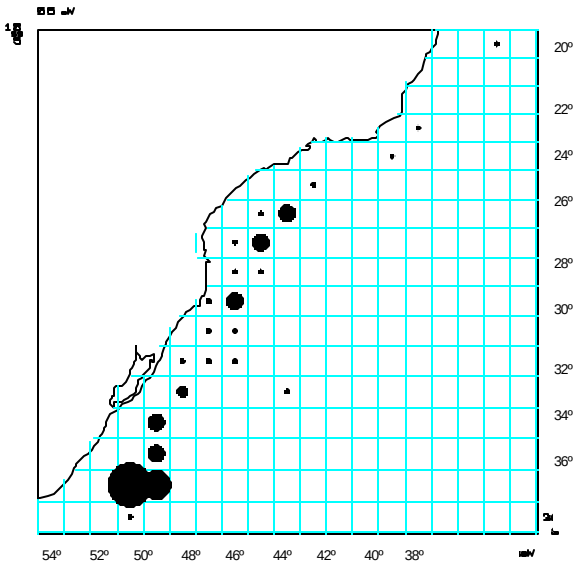
Fig. 23 - Geographical distribution of skipjack catch (MT), by quarter, in the Brazilian baitboat fishery from Santa Catarina,during the period 1993 - 1996



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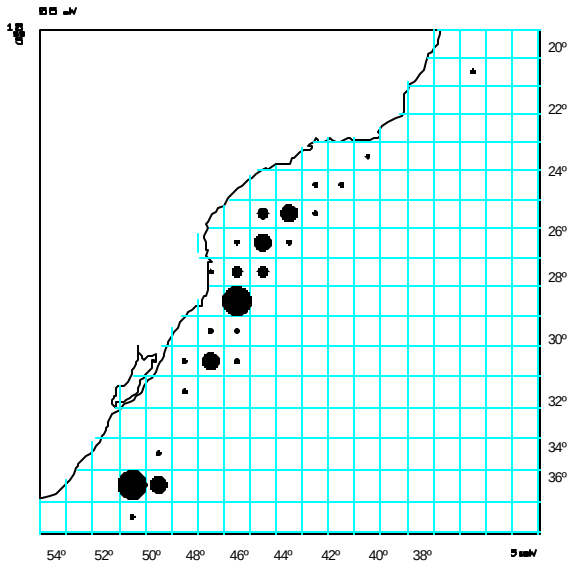

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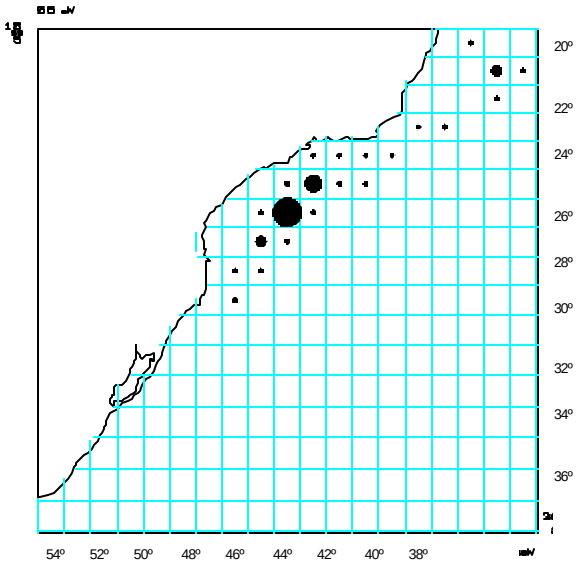

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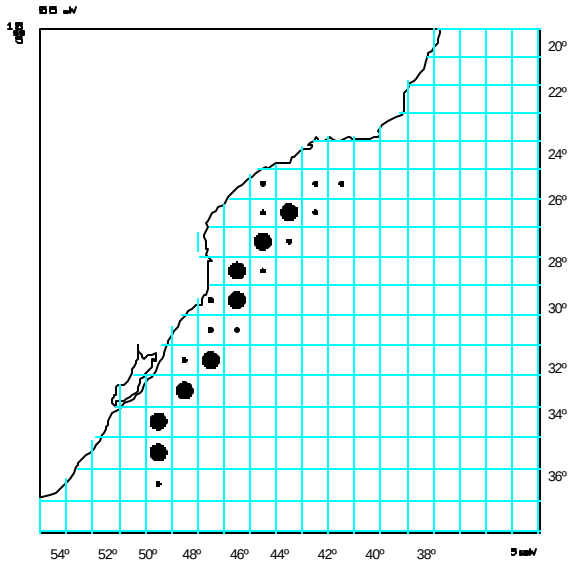

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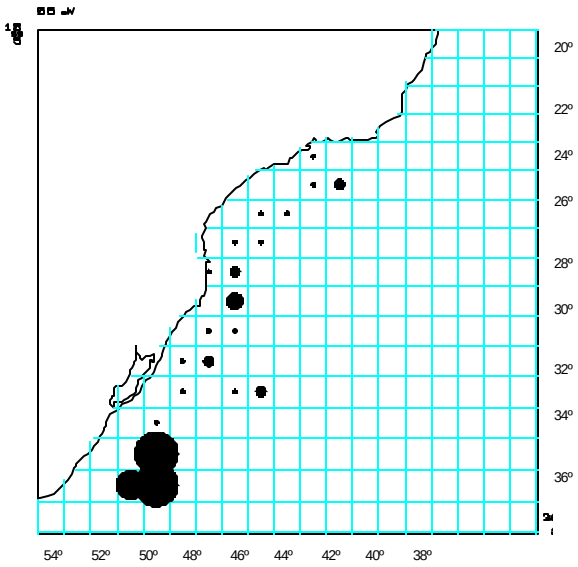
Fig. 24 - Geographical distribution of skipjack catch (MT), by quarter, in the baitboat fishery by foreign flagged leased vessels, during the period 1983 - 1985



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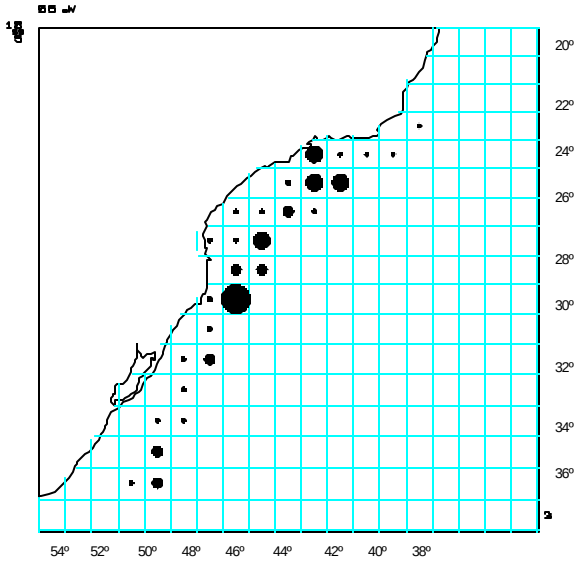

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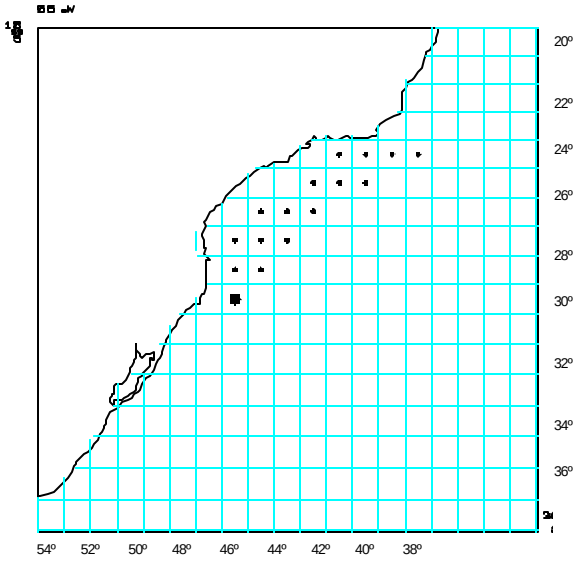

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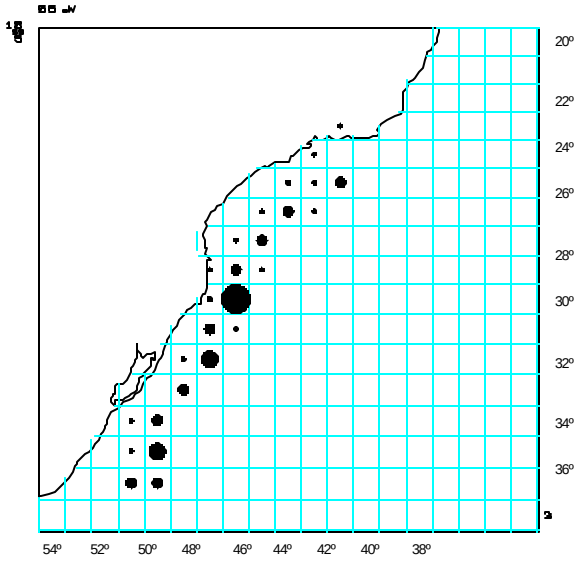
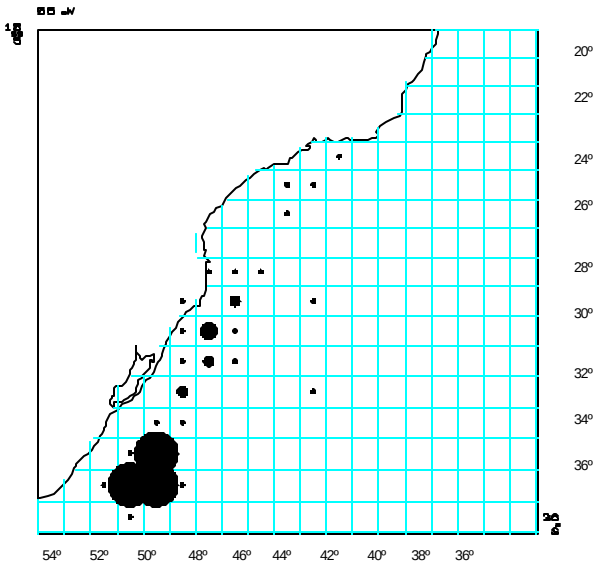


QUARTER - 4

< 50 50 - 100 100 - 250 250 – 500 500 - 1000 > 1000

Fig. 25 - Geographical distribution of skipjack catch (MT), by quarter, in the baitboat fishery by foreign flagged leased vessels, during the period 1986 - 1992



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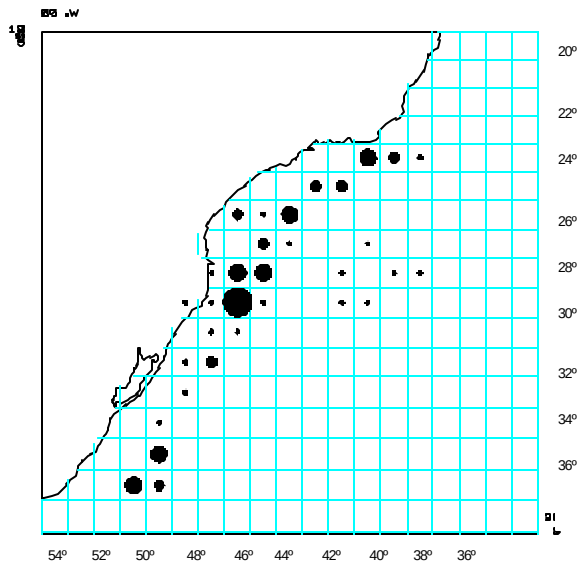

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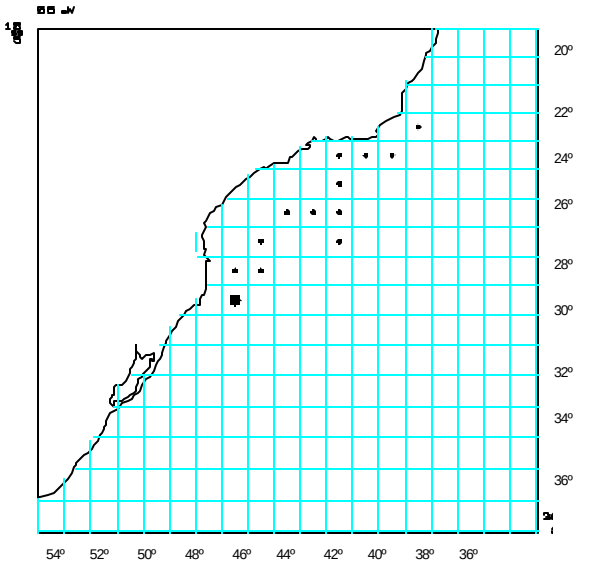
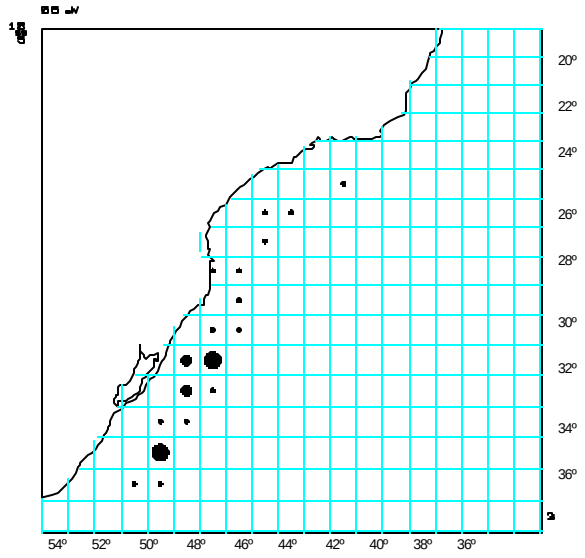


QUARTER - 3



QUARTER - 4

Fig. 26 - Geographical distribution of skipjack catch (MT), by quarter, in the baitboat fishery by foreign flagged leased vessels, during the period 1993 - 1996

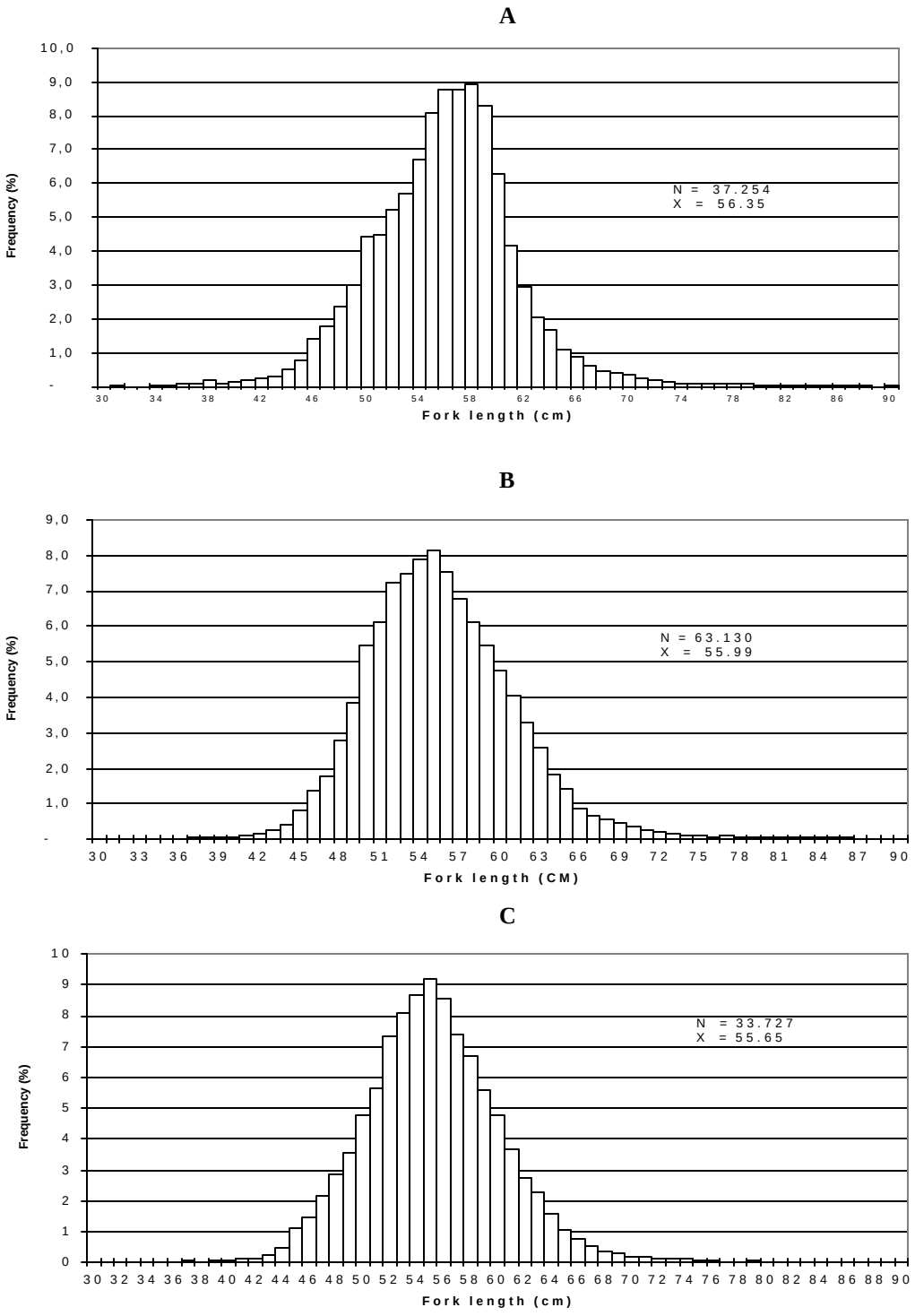


Fig. 27 - Combined fork length (cm) frequency distributions of skjpjack from catches taken by baitboat fleets in the south and southeast region of Brazil, between 1985-1996. A = Baitboats based at Rio de Janeiro; B = Baitboats based at Santa Catarina ; C = Leased baitboats; N = Sample Size; X = Mean Length.

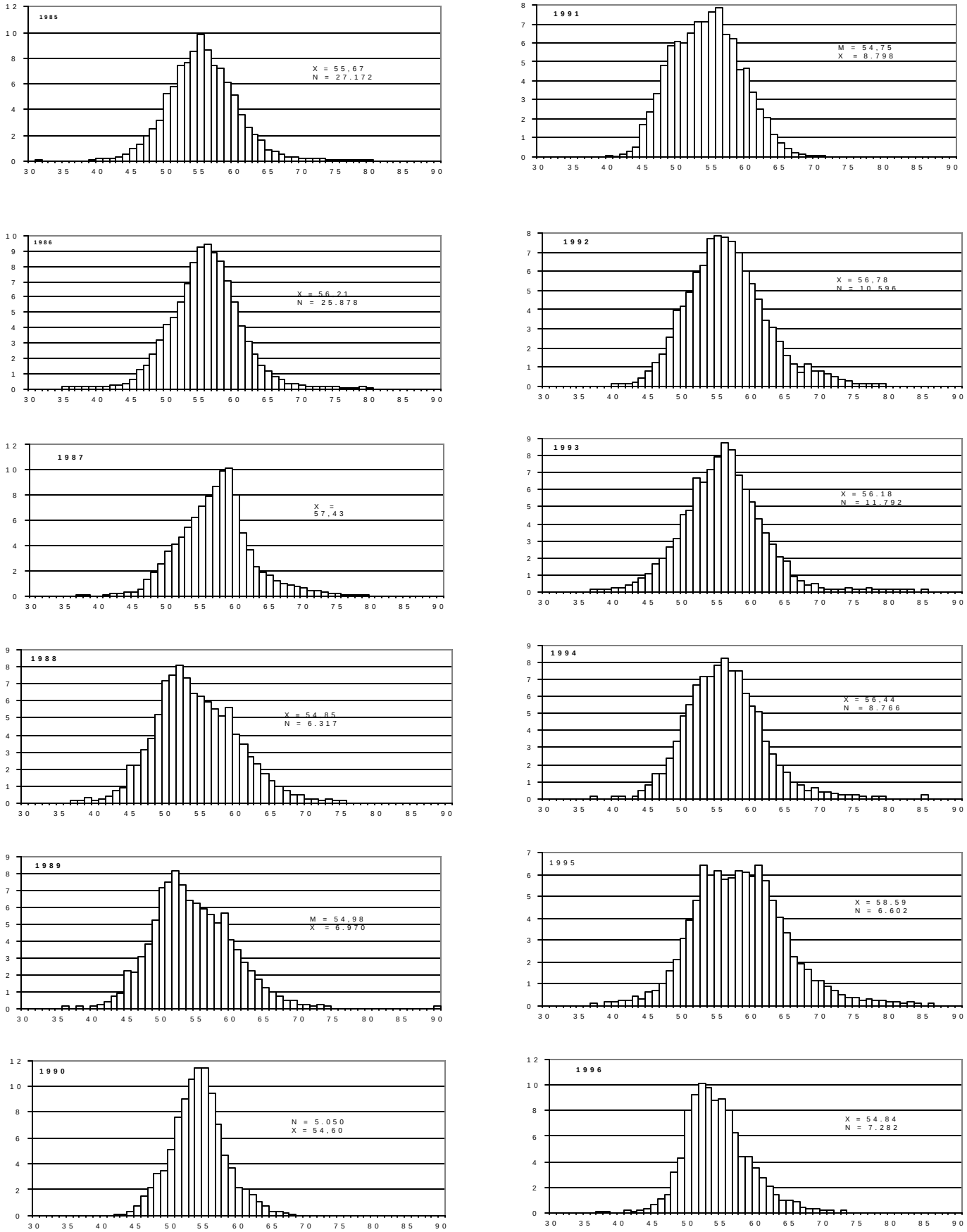


Fig - 28 -Annual fork length (cm) frequency distributions (%) of skipjack from catches by the Baitboat fishery off southeastern Brazil, during the period 1985 –1996. N = Sample Size X = Mean Length

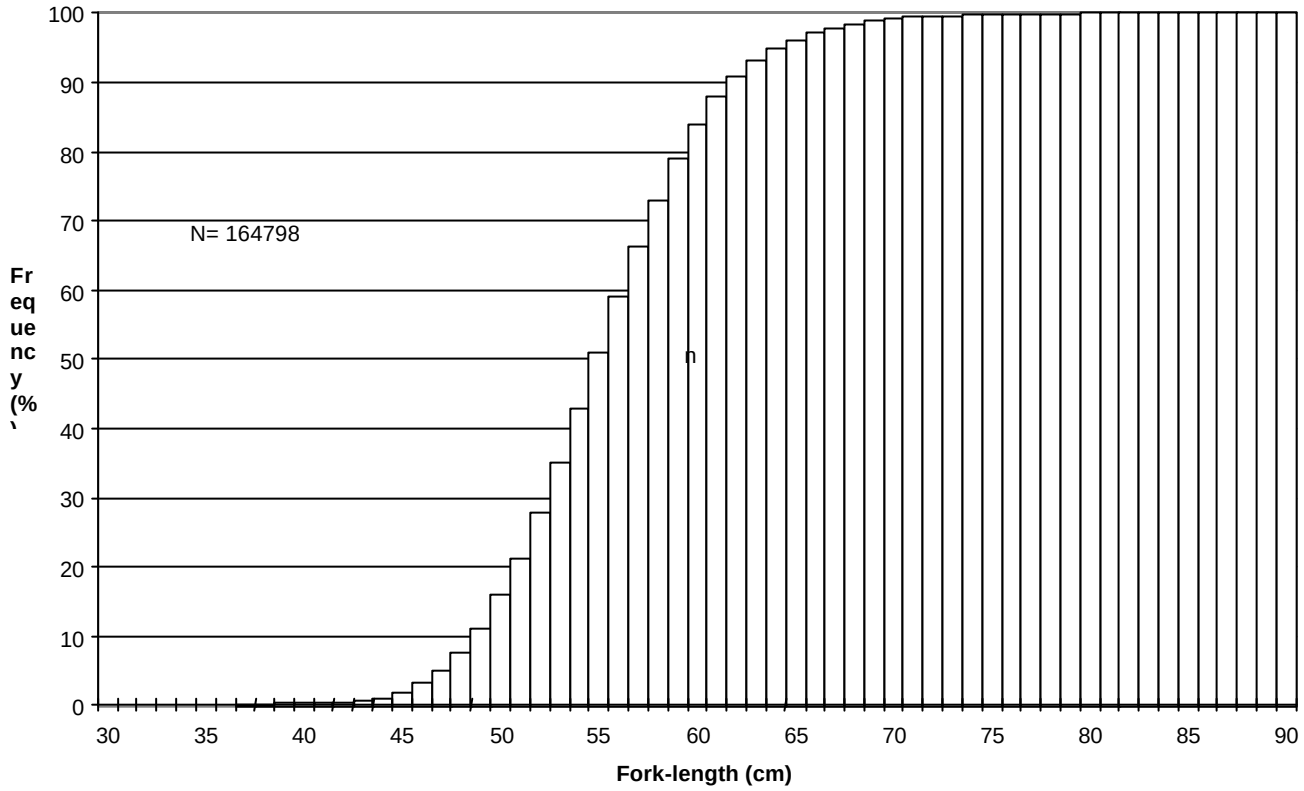


Fig. 29 – Cumulative fork length (cm) frequency distribution of all skipjack measured from the baitboat fishery off southeastern Brazil, during the period 1985-1996.