

SHARK DATA FROM SANTOS LONGLINERS FISHERY OFF SOUTHERN BRAZIL (1971-2000).

Amorim, A.F.¹ Arfelli, C.A.¹; Bacilieri, S.²

ABSTRACT

The historical series from 1971 to 2000 of Chondrichthyes caught by longliners based in Santos City, Sao Paulo State, Brazil, have been reviewed and the fishery biology of some of the species has been studied.

*The Brazilian Santos fleet started in 1965/66 with two boats, increasing gradually until a maximum of 20 boats, in 1998 and 19 in 1999. In 2000 comprised 14 vessels (13 national and 1 leased) operating in the area 17-35° S, 27-52° W. Since 1977 yields of sharks have shown an increasing trend, reaching about 60% of the longline total catch in 1993. Since the beginning of this fishery, most of shark's meat had market. Nevertheless only few shark species had high commercial value, so some of them were discarded, mainly blue shark. After 1977, shark market started increasing and the fishermen began to gradually bring all hooked sharks including blue shark. Also the price of shark fins brought as bycatch had six times increase in the last ten years. Blue shark (*Prionace glauca*) was the main species and responsible for about 30% of the Santos longliners catch. The 33 shark and 2 ray species identified belong to the following families: Alopiidae, Carcharhinidae, Hexanchidae, Lamnidae, Megachasmidae, Odontaspidae, Pseudocarchariidae, Sphyrnidae, Dasyatidae and Mobulidae. Yield, fishing effort and biological aspects of some species are presented.*

RÉSUMÉ

Les séries historiques 1971-2000 de Chondrichthyes capturées par les palangriers basés à Santos, dans l'état de Sao Paulo, ont été examinées, et la biologie de quelques-une de ces espèces a été étudiée.

*La flottille brésilienne de Santos a débuté en 1965/1966 avec deux bateaux, puis s'est accrue jusqu'à un maximum de 20 unités en 1998 et 19 en 1999. En 2000 elle comprenait 14 bateaux (13 nationaux et 1 en location) qui pêchaient dans la zone située entre 17°S et 35°S, et 27°W et 52°W. Depuis 1977, la production de requins a montré une tendance croissante, et a atteint environ 60% de la prise palangrière totale en 1993. Depuis les débuts de la pêche, la plus grande partie de la chair de requin trouve des débouchés. Toutefois, quelques-unes seulement des espèces de requins avaient une valeur commerciale élevée, si bien que certaines étaient rejetées, surtout le requin peau bleue. A partir de 1977, le marché de la chair de requin a commencé à se développer, et les pêcheurs se sont mis progressivement à ramener tous les requins capturés, y compris le requin peau bleue. Aussi, le prix des ailerons de requins débarqués en tant que prise accessoire a augmenté du sextuple depuis dix ans. Le requin peau bleue (*Prionace glauca*) était l'espèce principale, et constituait 30% environ de la prise des palangriers de Santos. Les 33 espèces de requins et les deux espèces de raies qui ont été identifiées appartenaient aux familles suivantes: Alopiidae, Carcharhinidae, Hexanchidae, Lamnidae, Megachasmidae, Odontaspidae, Pseudocarchariidae, Sphyrnidae, Dasyatidae et Mobulidae. La production, l'effort de pêche et les aspects biologiques de quelques-unes de ces espèces sont présentés.*

¹Instituto de Pesca, Av. Bartolomeu de Gusmão, 192, Santos, SP, Brasil, CEP 11030-906, crisamorim@uol.com.br and arfelli@zaz.com.br

²UNESP, Instituto de Biociências, Departamento de Zoologia, Rio Claro, SP, Brasil. M.Sc. Student, CAPES Scholarship, sbacilieri@bol.com.br.

RESUMEN

En este documento se revisan las series históricas de 1971 a 2000 de condricios capturados por palangreros con base en Santos City, Estado de Sao Paulo, Brasil, y se estudia la biología de algunas especies de la pesquería.

*La flota brasileña de Santos empezó a pescar en 1965-1966 con dos barcos, y este número fue incrementándose gradualmente hasta llegar a 20 barcos en 1998 y 19 en 1999. En 2000 estaba compuesta por 14 barcos (13 nacionales y 1 fletado) que operan en la zona 17°-35° S, 27°-52° W. Desde 1997, la producción de tiburones ha mostrado una tendencia creciente, hasta llegar al 60% de la captura total de palangre en 1993. Desde los inicios de esta pesquería, la mayor parte de la carne de tiburón ha tenido salida en el mercado. Sin embargo, sólo unas pocas especies de tiburones alcanzaban un alto valor comercial y, por esta razón, algunos tiburones eran descartados, sobre todo el tiburón azul. A partir de 1997, el mercado de carne de tiburón empezó a crecer y los pescadores empezaron a llevar al puerto todos los tiburones que capturaban, incluyendo también al tiburón azul. Asimismo, el precio de las aletas de tiburón desembarcadas como captura fortuita se ha multiplicado por seis en los últimos diez años. El tiburón azul (*Prionace glauca*) fue la especie principal y respondió de aproximadamente el 30% de la captura los palangreros de Santos. Las 33 especies de tiburones y las dos especies de rayas identificadas pertenecen a las siguientes familias: Alopiidae, Carcharhinidae, Hexanchidae, Lamnidae, Megachasmidae, Odontaspidae, Pseudocarchariidae, Sphyrnidae, Dasyatidae y Mobulidae. Se presentan los rendimientos, el esfuerzo de pesca y las características biológicas de algunas especies.*

KEY WORDS

*Shark fishery biology; Santos longliner; longliners based in Santos City, Sao Paulo State, Brazil; blue shark (*Prionace glauca*); mako shark (*Isurus oxyrinchus*); bigeye thresher (*Alopias superciliosus*); shark yield, fishing effort and biological aspects.*

I - INTRODUCTION

Tuna fishery settled in Santos City, Sao Paulo State, Brazil, began in 1958 with Japanese leased longliners, fishing until 1961 (MORAES, 1962; MORAIS, 1963) nevertheless the shark catch was not recorded (AMORIM; ARFELLI; FAGUNDES, 1998).

The national longliner fishery in Santos, started in 1965/66 with two boats (ARFELLI & AMORIM, 1988), increasing gradually until a maximum of 20 boats in 1998 and decreasing again to 14 in 2000. These longliners ranging from 192 – 25 TB and 52 - 22 TL (34 to 16 meter long), presented great variation, in its fishing goals. Some leased longliners (with flags of Barbados, Honduras and Panama), have been operating since 1992, also in the South and Southeast off Brazil, and unload in Santos Fishing Terminal (AMORIM & ARFELLI, 2000).

In the studied 1971/99 periods the Santos fleet presented great fishing goals variation. In the first ten years the main target of the Santos longliners was the three species of tunas (*Tunnus albacares*, *T. obesus* and *T. alalunga*). The three tunas represented about 55% of total catch and sharks less than 9% in 1973. After 1974 shark catch gradually increased, with a minimum of 11% of Santos longliners catch in 1974 to 59% in 1993. Targeting on sharks, blue shark was the responsible for this raise represented about 30% of total yield (ARFELLI; AMORIM; FAGUNDES, 1997). Also these longliners brought large amount of sailfish, white and blue marlin, mari mari, different sharks species, blue shark and swordfish. Nevertheless, the mainly change was in 1994-96 aiming the catch of swordfish. Since 1971 to 1994 all boats used to operate with the traditional Japanese longline, nevertheless from May 1994, part of this fleet started to change this equipment to the surface longline

(monofilament with light stick attraction), directed towards swordfish (ARFELLI, 1996). From 1997 to the present time all boats were using the new equipment (AMORIM & ARFELLI, 2000).

The shark' species were commercialized since the beginning of the period as mako shark, part of blue shark catch, bigeye thresher, hammerhead and species of Carcharhinidae family (SADOWSKY, V. & AMORIM, A.F., 1977; AMORIM, 1992).

From 1965/67 to the 70's, the tuna fleet from Santos operated in the area 20° - 33° S and 39° - 50° W. This area is related to the presence of school of fishes with commercial value and autonomy of the boats. In the 70's they used to fish from the beginning of May to middle of October, to the south of latitude 25° S, and to the north of latitude 27° S in the other months. From 1979 on the tuna boats kept following the mentioned schedule, but also operated in none traditional areas for the season (AMORIM & ARFELLI, 1984). The captain, with more knowledge of the seasonally of fishing areas, gradually fished where the abundance was higher and landed almost all the fish hooked (AMORIM, 1992).

78 different pelagic and coastal shark species have been recorded from the Brazilian coast according to AMORIM & ARFELLI (2000).

The present report contains analyses of yield, CPUE and biological information of the blue shark, mako shark, big eye thresher, and others grouped sharks caught by the Santos fleet from 1971 to 2000, as well as data of these boats.

II - MATERIAL AND METHODS

The data and material utilized in this study were mostly obtained from Santos longliners at the Fishing Terminal in Santos City, Sao Paulo State. Also the researchers from "Instituto de Pesca" took 23 research trips on these longliners from 1974 to 1994.

According to the commercial companies the sharks were sold and recorded in 5 groups as follows: blue shark, *Prionace glauca* only; mako shark, only *Isurus oxyrinchus*; bigeye thresher, *Alopias superciliosus* (*Alopias vulpinus* less than 1%); hammerhead, included two species *Sphyrna lewini* (mainly), and *Sphyrna zygaena*; and other sharks comprised mainly by species of genus *Carcharhinus*. The yield of the sharks groups were recorded by individual fish carcass weight and converted to total weight.

The fishing effort, was obtained of the captains' logbooks and of interview in the Fishing Terminal of Santos, while the weight was obtained from the log commercial sheets of the fishing companies and also from the Fishing Terminal.

The dressed weight is obtained from the carcass (without head, gill, gut and fins), as the fish is commercialized with 1 kg of approximation (AMORIM, 1992).

The annual and monthly yield (in total weight - kg) and effort (in thousand hooks) are presented for 1971 to 2000 for blue, mako and bigeye thresher.

The fishing area is 20° - 33° S and 39° - 50° W and extended to 15° - 35° S and 30° - 50° W. Nevertheless it was considered the area 20° - 30° S and 40° - 50° W.

The 2000 data comes from "Relatório Interno sobre os Desembarques da Frota de Espinhel-de-superfície nos Municípios de Santos e Guarujá, Núcleo de Economia e Estatística Pesqueira of "Instituto de Pesca".

The methodology used basically follows that presented in AMORIM and ARFELLI (1984); ARFELLI and AMORIM (1988).

III - RESULTS AND DISCUSSION

In the 1971-92 period the number of longliners increased from 3 to 13 in 1991. Increasing again to 20 in 1998 and decreasing to 14 in 2000 (Table 1). Basic characteristics of these longliners in 2000, is presented in the Table 2.

A statistical revision of Santos longliners, including annual yield and fishing effort of all Santos fleet by species or group of species caught off south and southeast of Brazil (20° - 30° S and 40° - 50° W), from 1971-2000. Also, monthly yield and fishing effort by species or group of species from 1971-97. Including monthly yield and fishing effort by species or group of species from 1992-97 of leased boats. Including yet the number and weight of blue and mako sharks from 1971 to 1991. The figure 1 shows total yield and fishing effort of Santos longliners from 1971 to 2000. Figure 2 shows total yield of tunas, swordfish, sharks and others bone fish (in total weight) of Santos fleet from 1971 to 2000. Figures 3 to 20 show monthly yield (kilograms) of mako, blue and bigeye thresher sharks, from 1971 to 1998.

The shark's meat from national longliners, based in Santos always was commercialized. For these longliners sharks fins was the only bycatch.

The biological information of mako, blue and bigeye thresher is showed in the paper of AMORIM; ARFELLI; FAGUNDES (1998).

The mako shark is caught by Santos longliners all year round, mainly in November and in lower proportion in February. In the period 1971-90 the highest and lowest catch were 194 t and 3,241 fish (1990), and 19 t and 267 fish (1975). From April to November the catches in weight and number were higher, but the average weight decreased. It probably happened due to the recruitment period. The 28 embryos (14 males and 14 females) from 4 uterus and two newborn (males) were analyzed. The uterus were collected in August and September 1994. The major number of embryos per female was 14 and the sex ratio 1:1. The embryos presented average total length of 69.9 cm. The two newborn average size was 67.8 cm (September - 1994). The pregnant period of the shortfin mako is about a year, and the birth size is about 67.0 to 72.0 cm. The higher annual frequencies of total length were in the classes among 130 and 250 cm, mainly 180, 200 and 220 cm classes. This is an area of birth, growth and matting, nevertheless lacks pregnant mature female in the early stages of embryos development. Mature females were found only with embryos near to born by COSTA *et alii*, (1993 a, b, c and 1995) and COSTA (1994). According to VASKE & RICON (1993), the mako shark is mainly ictiophagous through the analyzes of 32 stomachs between August 1990 to June 1991. The 13 were empty and the others had mainly *Brama brama*, *Lepidocybium flavobrunneum* and *Trichiurus lepturus* (AMORIM; ARFELLI; FAGUNDES, 1998).

The blue shark was caught by Santos longliners and the average yield from 1971 to 1974 was 8.4 t, due to the very low commercial value that the species used to have. Only from 1975 the discard reduced. Initially the fisherman putting on board only the specimens caught during the last 10 days. By this way the blue shark come well conserved and the market price increased. After that the fisherman brought all the specimens caught. For this reason the yield started increasing year by year reaching 1,258 t (in total weight) in 1990. From 1991 to 1994 the yield established around 1,244 t. From 1983 to 1993 it was the mostly caught species by these longliners, except in 1988. The highest catches were in the third quarter from 1971 to 1979 and in second from 1980 to 1990. As the tuna catch was getting difficult and the blue shark was very abundant, at least, part of the time blue shark was the main goal of this fishery. It represented 30% of total catch, in the period 1984-94. Its highest yield occurred from May to July and the lowest in December and January (AMORIM 1992; ARFELLI & AMORIM 1994; AMORIM *et alii*, 1995). According to AMORIM (1992); and AMORIM; ARFELLI; BRAGA (1993), some biological parameters of blue shark were obtained: rate of growth (k) = 0.1126; total mortality coefficient for the 1971-88 period (Z) = 0.1220 (1972) to 0.1488 (1987); natural mortality (M) = 0.1256; fishing mortality coefficient (F) = 0.0001 (1971) to 0.0232 (1987). The female of blue shark develops its reproductive cycle off South and Southeast of Brazil, where the fertilization occurs after

the mating from November to March (sex ratio was 1:1). So females, marked with scars by the males during the copulation, start their embryonic cycle, that is probably annual. In March two female groups with scars and embryos were found: some with recent bites had embryos of about 3 cm; and the females presented older copulation scars, had embryos about 16 cm long. Birth happened from November-December where the embryos were 45-50 cm long (AMORIM 1992). The specimens occurrence area in the early stage of life, right after birth, is probably far from the fisheries area, because it was not observed any blue shark embryo in the stomach contents of other large species caught by the longliners. However, specimens of small size (over 3 kg) are caught in small quantity from June to August. These exemplars were probably 6 months old. The parasites found in the intestine and gills of blue sharks were family Loimidae and Diclocellidae. 30 males and 33 females caught from April 1994 to April 1995 by longliners from Natal City – “Rio Grande do Norte” State were studied. The males ranged from 164 to 247 cm (furcal length) and the females from 170 to 230 cm. 42.4 % of female were in pre-ovulatory phase and 57.6% were pregnant. These females had an average of 25 embryos about 5.3 cm to 16.8 cm (HAZIN *et alii*, 1995a, b and c). HAZIN *et alii*, (1993), studied blue shark reproduction from February 1990 to July 1992, in the South-Western Equatorial Atlantic based in Natal longliners. Females were found in 4 different, well defined reproductive stages: pre-ovulatory (25%), pregnant (53%), post-ovulatory (non pregnant) (0%) and immature (14%). The females that were early pregnant ranged from 162 cm (fork length) to 225 cm. Ovulation and fertilization took place from December to July. After pregnancy began, females left this fishing ground, moving southward. The male size ranged from 156 cm to 250 cm. According to VASKE & RINCON (1993), through the examination of 68 stomachs between August 1990 to June 1991, blue shark is mainly teutophagous. From these stomachs, 28 were empty and the others had mainly *Chirotenthis veranyi*, *Morotenthis robsoni* and *Ancistrocheirus lesueuri* (cephalopod) and *Lepidocybium flavobrunneum* (gempylid).

For bigeye thresher, it has been caught by Santos longliners all year round and of the “thresher” catch 99.9% belongs to this species. Its annual yield ranged from 1 t (1971) to 103.6 t (1992) with an increasing trend. The catches were always higher from July to October, and lower from December to February. The analysis of the annual total weight-frequency in the 1989-91 period showed that the largest proportion of the catch was distributed from 85-250 kg to 280-310 kg mainly 113-140 kg (39% of total bigeye thresher). In this period, the caught specimens ranged from 0-28 kg to 280-310 kg classes. The largest bigeye thresher was 294 (April of 1989). Nevertheless a fish of 427 kg was registered but not confirmed in November 1991. Six females bigeye thresher with 2 embryos each were observed. The embryos average length were: 79.2 cm in October; 75.4 cm in November; 97.1 cm in December and 103.0 in March. The birth probably occurs in from December to March according to the birth size cited in the literature, about 100 cm (AMORIM; ARFELLI; FAGUNDES, 1998).

Porbeagle, *Lamna nasus* is very rare. Two Specimens of porbeagle were caught by Imaipesca longliner in August and September respectively in 1983, off North of Santa Catarina State. The first specimen was a female with 201 cm and 85 kg, it was caught at 26° 45'S-46° 08'W in water approximately 680 m deep; and the second specimen caught at the same area about 1,200 m deep; nevertheless it was not available for analyzes because it had been commercialized, weighing 70 kg (dressed). The morphometrics measurements and dental formula of first exemplar were cited by SADOWSKY, ARFELLI, AMORIM (1985). This is the first reported occurrence of the species in Brazilian waters (SADOWSKY, ARFELLI, AMORIM, 1984). It was observed that other 35 fish were caught by Santos longliners mainly from May to December in Southern Brazil. The size of the specimens ranged from newborn to 98 kg (AMORIM; ARFELLI; FAGUNDES, 1998).

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REFERENCES

- AMORIM, A.F. 1992. Estudo da biologia da pesca e reprodução do cação-azul, *Prionace glauca* L. 1758, capturado no sudeste e sul do Brasil. Tese de Doutorado. Instituto de Biociências, UNESP Campus de Rio Claro: pp 1-205.
- AMORIM, A.F. and C.A. Arfelli. 1984. Estudo biológico-pesqueiro do espadarte, *Xiphias gladius* Linnaeus, 1758, no Sudeste e Sul do Brasil, (1971 a 1981). B. Inst. Pesca, São Paulo, 11(único): pp 35-62.
- AMORIM, A.F. and C.A. Arfelli. 2000. Sharks occurrence update in the Brazilian coast. II Reunião da Sociedade Brasileira para o Estudo de Elasmobrânquios - SBEEL; RESUMOS, Santos, pp 85.
- AMORIM, A.F.; C.A. Arfelli; F.M.S. Braga. 1993. Blue shark (*Prionace glauca*) reproduction off South and Southeast of Brazil. In: 9th Meeting of American Elasmobranch Society- ABSTRACTS, 27 May - 02 June, Austin, Texas, Austin, Texas, pp. 68.
- AMORIM, A.F.; C.A. Arfelli; L. Fagundes. 1998. Pelagic elasmobranchs caught by longliners off southern Brazil during 1974-97: An overview. *Marine and Freshwater Research*, CSIRO, Collingwood, 49(7): pp 621-32.
- AMORIM, A.F.; F.M.S. Braga; L. Fagundes; C.A. Arfelli. 1995. Analysis on blue shark, *Prionace glauca*, fisheries of Santos longliners from southern Brazil (1971-94). VII Reunião do Grupo de Trabalho sobre Pesca e Pesquisa de Tubarões e Raias no Brasil-RESUMOS, Rio Grande: pp 13.
- ARFELLI, C.A. 1996. Estudo da Pesca e Aspectos da Dinâmica Populacional de Espadarte *Xiphias gladius* L. 1758, no Atlântico Sul. Tese de Doutorado. Instituto de Biociências, UNESP Campus de Rio Claro: pp 1-175.
- ARFELLI, C.A. and A.F. Amorim. 1988. Description of the Brazilian swordfish fishery, in Santos. *Collective Volume of Scientific Papers*, ICCAT, Madrid, 27: pp 315-7.
- ARFELLI, C.A. and A.F. Amorim. 1994. Shark fishery from Santos-SP longliners off South and Southeast of Brazil. *PROCEEDINGS*, Fourth Indo-Pacific Fish Conference, 28 Nov.-4 Dec., 1993 Bangkok.
- ARFELLI, C.A.; A.F. Amorim.; L. Fagundes. 1997. Diagnose das pescarias dos atuneiros de Santos (1971-95). *RESUMOS EXPANDIDOS*, VII COLACMAR, 22 a 26 de setembro de 1997, Santos, 1: pp 48-50.
- COSTA, F.E.S. 1994. Análise da pesca e aspectos da biologia do anequim *Isurus oxyrinchus* Rafinesque, 1809 capturado nas regiões sudeste e sul do Brasil (Elasmobranchii-Lamnidae). Dissertação de Mestrado, Instituto de Biociências, UNESP Campus de Rio Claro: pp148.
- COSTA, F.E.S.; F.M.S. Braga; A.F. Amorim.; C.A. Arfelli. 1993a. Análise anual da pesca do anequim, *Isurus oxyrinchus* (Rafinesque, 1809) nas regiões sudeste e sul do Brasil. VI Reunião do Grupo de Trabalho sobre Pesca e Pesquisa de Tubarões e Raias no Brasil-RESUMOS, Recife: pp. 14.
- COSTA, F.E.S.; F.M.S. Braga; A.F. Amorim.; C.A. Arfelli. 1993b. Análise do fator de condição para o anequim, *Isurus oxyrinchus* (Rafinesque, 1809) durante os anos de 1971 a 1990. VI Reunião do Grupo de Trabalho sobre Pesca e Pesquisa de Tubarões e Raias no Brasil-RESUMOS, Recife: pp. 8.

- COSTA, F.E.S.; F.M.S. Braga; A.F. Amorim.; C.A. Arfelli. 1993c. Análise mensal da pesca do anequim, *Isurus oxyrinchus* (Rafinesque, 1809) nas regiões sudeste e sul do Brasil. VI Reunião do Grupo de Trabalho sobre Pesca e Pesquisa de Tubarões e Raias no Brasil-RESUMOS, Recife: pp. 13.
- COSTA, F.E.S.; F.M.S. Braga; A.F. Amorim.; C.A. Arfelli. 1995. Reproductive biology of shortfin mako, *Isurus oxyrinchus* Rafinesque, 1809. VII Reunião do Grupo de Trabalho sobre Pesca e Pesquisa de Tubarões e Raias no Brasil-RESUMOS, Rio Grande: pp. 30.
- HAZIN, F.H.V.; C.E. Boeckmann; E.C. Leal. 1993. Reproduction of the blue shark, *Prionace glauca*, in the south-western equatorial Atlantic. VI Reunião do Grupo de Trabalho sobre Pesca e Pesquisa de Tubarões e Raias no Brasil-RESUMOS, Recife: pp. 45.
- HAZIN, F.H.V.; P.B. Pinheiro; R.P.T. Lessa. 1995a. Biologia reprodutiva do tubarão azul, *Prionace glauca* no Atlântico sudoeste equatorial. VII Reunião do Grupo de Trabalho sobre Pesca e Pesquisa de Tubarões e Raias no Brasil-RESUMOS, Rio Grande: pp. 39.
- HAZIN, F.H.V.; T. Vasque Junior; R.B. Lucchesi; S.M.G. Mattos; P.G.V. Oliveira; T.S.A.L. Souza; R.P. Lessa; J.A.M. Wandelely Junior. 1995b. Biologia reprodutiva de *Carcharhinus plumbeus* (Nardo, 1827), (tubarão-sucuri) no litoral do estado de Pernambuco. VII Reunião do Grupo de Trabalho sobre Pesca e Pesquisa de Tubarões e Raias no Brasil-RESUMOS, Rio Grande: pp. 38.
- HAZIN, F.H.V.; J.R. Zagaglia; P. Travassos; T.S.A.L. Souza; P.G.V. OLIVEIRA. 1995c. Distribuição e abundância relativa do tubarão toninha (*Carcharhinus signatus*) e tubarão azul (*Prionace glauca*) no Atlântico sudoeste equatorial. VII Reunião do Grupo de Trabalho sobre Pesca e Pesquisa de Tubarões e Raias no Brasil-RESUMOS, Rio Grande: pp. 43.
- MORAES, M.N. 1962. Development of the tuna fishery of Brazil and preliminary analysis of the first three years data. Arq. Est. Biol. Mar. Univ. Ceará, 2(2): pp. 35-57.
- MORAIS, S.B. 1963 Uma pescaria do atuneiro "Kaiko Maru 12". Bol. Estud. Pesca, Recife, 3(5): pp. 15-18.
- SADOWSKY, V. and A.F. Amorim. 1977. Sobre a composição da fauna, dos esqualos pelágicos do Brasil. 29ª Reunião Anual-SBPC RESUMOS-Suplemento de Ciência e Cultura, SP, 29 (7): pp. 792.
- SADOWSKY, V.; C.A. Arfelli.; A.F. Amorim. 1984. Primeiro registro de tubarão-golfinho, *Lamna nasus* (Bonnaterre, 1788), em águas brasileiras. 36ª Reunião Anual-SBPC RESUMOS-Suplemento de Ciência e Cultura, SP, 36 (7): pp. 686-7.
- SADOWSKY, V.; C.A. Arfelli; A.F. Amorim. 1985. First record of porbeagle, *Lamna nasus* (Bonnaterre, 1788), in the Brazilian Atlantic. B.Inst.Pesca, São Paulo 12(2): 49-53, 1985 b.
- VASKE Jr., T. and F.G. RICON. 1993. Análise do conteúdo estomacal dos tubarões azul (*Prionace glauca*) e anequim (*Isurus oxyrinchus*) no sul do Brasil. VI Reunião do Grupo de Trabalho sobre Pesca e Pesquisa de Tubarões e Raias no Brasil-RESUMOS, Recife: pp. 20.

Table 1. Number of longliner based in the Santos Fishing Terminal

| Year | Longliner | Year | Longliner |
|-------------|-----------|-------------|---------------|
| 1971 | 3 | 1986 | 6 |
| 72 | 3 | 87 | 6 |
| 73 | 4 | 88 | 9 |
| 74 | 5 | 89 | 10 |
| 75 | 5 | 90 | 11 |
| 76 | 4 | 91 | 13 |
| 77 | 5 | 92 | 15 (1 leased) |
| 78 | 5 | 93 | 16 (3 leased) |
| 79 | 5 | 94 | 15 (2 leased) |
| 80 | 5 | 95 | 16 (3 leased) |
| 81 | 6 | 96 | 18 (4 leased) |
| 82 | 6 | 97 | 17 (2 leased) |
| 83 | 9 | 98 | 20 (5 leased) |
| 84 | 8 | 99 | 19 (3 leased) |
| 85 | 7 | 2000 | 14 (1 leased) |

Table 2. Basic characteristics of the longliners based in Santos (SP) in 2000.

| SANTOS 2000 | BOAT LENGTH (meters) | TB | TL |
|---------------------|-------------------------|------|------|
| Taihey Maru 3 | 33 | 149 | 45 |
| Sea Wolf (leased) | 29 | 136 | 65 |
| Kaiko Maru 16 | 27 | 100 | 48 |
| Itapuí I | 27 | 121 | 34 |
| Comandante Danil | 27 | --- | --- |
| Imaipesca | 24 | 107 | 72 |
| Progressão | 24 | 105 | 70 |
| Argonauta | 24 | 110 | 37 |
| Camburi | 22 | 88 | 26 |
| Oceano Brasil | 22 | 88 | 26 |
| Falcon I | 22 | 81 | 24 |
| Andréas | 22 | ---- | ---- |
| Elisabeth Vitória I | 19 | 44 | 13 |
| Jonas | 16 | 26 | 22 |