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ELASMOBRANCH SPECIES LANDED IN ITAJAÍ HARBOR, SOUTHERN BRAZIL

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ABSTRACT

Fishing activity in the Itajaí harbor (SC) has concentrated a large fishing fleet, operating with many different methods of capture. This paper presents a checklist of the species of elasmobranchs landed in Itajaí, and analyses the respective landing frequencies in the fishing methods. Elasmobranchs were observed in catches of purse seine, single trawl, double rig trawl, pair trawl, surface longline, bottom longline, surface gillnet, bottom gillnet and traps. In total, 85 species were found (54 sharks and 31 skates and rays) and of them, 22 shark species and 6 skates were very abundant in at least one fishing art.

Keywords: elasmobranchs, fishing, Brazil.

ESPÉCIES DE ELASMOBRÂNQUIOS DESEMBARCADAS NO PORTO DE ITAJAÍ, SUL DO BRASIL

RESUMO

O porto pesqueiro de Itajaí (SC) tem crescido muito rapidamente, concentrando uma grande e diversificada frota que utiliza diferentes artes de pesca. No presente trabalho foram identificadas as espécies de elasmobrânquios desembarcadas, as artes de pesca que as capturam e suas freqüências nas descargas. Um total de oito artes capturam elasmobrânquios: cerco, arrasto de tangones e parelha, espinhel de superfície e de fundo, emalhe de superfície e de fundo, e covos. Encontrou-se um total de 85 espécies (54 tubarões e 31 raias), sendo que 22 espécies de tubarões e 6 de raias apresentaram-se abundantes em pelo menos uma arte de pesca.

Palavras-Chaves: elasmobrânquios, pesca, Brasil.

INTRODUCTION

Itajaí (Santa Catarina State, Brazil) is an important fishing harbor on Brazilian coast and concentrates a diversified fleet of fishing boats (Andrade, 1998). This fleet is composed mainly by purse seiners, trawlers, longliners, and gill-netters. The elasmobranch fishery using gill-netters is directed mainly to the scalloped hammerhead *Sphyrna lewini* (with driftnets) and angelsharks *Squatina* spp. (with bottom-set nets) (Kotas et al., no prelo). The other fishing methods capture elasmobranchs also, but that frequently are considered as by-catch.

In spite of the minor importance attributed to elasmobranch fisheries in many countries (Bonfil, 1994), landings of sharks,

rays and skates are notable in southern Brazil, reaching 25.000 tons in the 1988-1989 (Vooren, 1995) and only 5000 tons between 1991-1994 (Haimovici, 1997).

Elasmobranchs are considered to be limited in their reproduction modes, that make them vulnerable to high fishing pressure (Holden, 1974, 1977; Compagno, 1990). The history of some elasmobranch fisheries (Ripley, 1946; Olsen, 1954; Holden, 1968) reveals an initial increase in capture values followed by a rapid decline in catch rates as found by Haimovici (1997) in southern Brazil between 1976-1994. Knowing these tendency, was started in 1998 a series of biological-fishery studies by University of Vale do Itajaí. This paper presents a checklist of elasmobranch species landed by different fishing fleets in the Itajaí harbor and analyses their respective frequencies of occurrence in the landings.

MATERIAL AND METHODS

The sampling methodology was based in daily visitation at representative landing points of Itajaí (Perez *et.al,* 1998) from 1994 to 1999. Interviews with the skippers and fishermen were conducted in order to collect fishery data, e.g. fishing area and total capture (mt), and to examine their catches for elasmobranch identification *in situ* to the lowest taxonomic level. In most of the cases the fishes were landed eviscerated with their heads, first dorsal, pectorals and caudal fins removed. On the other hand, most of the skates and rays were landed intact, except the big ones whose viscera and heads were also removed rendering difficult their identification. Only the positively identified species were considered in this checklist. The identification was conducted based on Compagno (1984), Figueiredo (1977) and Bigelow & Schroeder (1948; 1953) works.

The frequency of occurrence in the landings was used as a criteria in order to classify the species in following categories: a) abundant, species observed in most of the landings; b) frequent: species occurring at least in a half of the landings recorded in one of the seasons of the year; and c) rare, species recorded less frequently than above.

RESULTS AND DISCUSSION

During the study period, elasmobranchs were captured by purse seines, single trawl, pair trawl, double rig trawl, surface and bottom longlines, bottom and surface gillnets. In 1995, one commercial boat operating with traps for exploratory fishing of crab (*Caceon* sp.), provided some sharks caught in the continental slope between 600 and 1000 meters depth.

The fishing boats operated from the border of Brazilian and Uruguayan waters (34ºS) to Rio de Janeiro coast (22ºS). Most of the elasmobranch catch occurred in the continental shelf (e.g. single trawl, pair trawl and

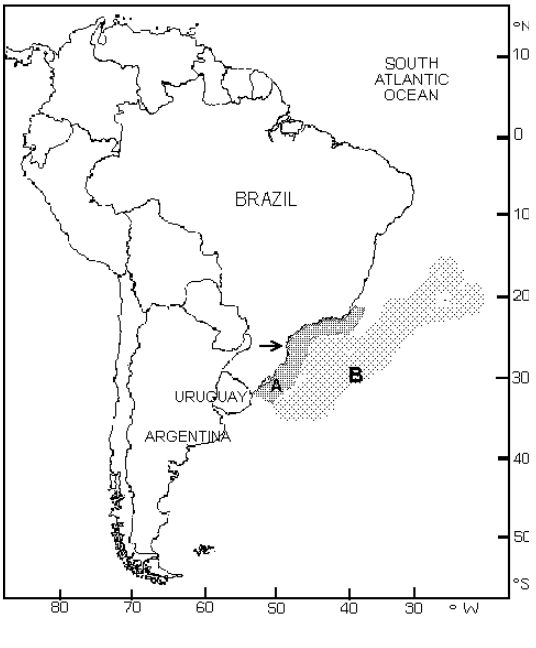

Figure 1: Coastal (A) and offshore (B) fishing areas in south Brazil. Arrow indicate Itajai.

Table 1a: Check list of elasmobranch species landed in Itajaí harbor including systematic classification, common names in english and in portuguese (in parentheses).

CLASS CHONDRICHTHYES
Subclass HOLOCEPHALII
Order CHIMAERIFORMES
Family **CALLORHYNCHIDAE**
Callorhinchus callorhinchus (Linnaeus, 1758)
Chimaera (peixe elefante).

Subclass ELASMOBRANCHII
Order ORECTOLOBIFORMES
Family **GINGLYMOSTOMIDAE** - nurse sharks
Ginglymostoma cirratum (Bonnaterre, 1788)
Nurse shark (lambaru, cação lixa).
Family **RHINCODONTIDAE** - whale Sharks
Rhincodon typus Smith, 1829
Whale shark (tubarão baleia, pintado, fantasma, rolão).

Order CARCHARHINIFORMES
Family **SCYLIORHINIDAE** - catsharks
Galeus arae (Nicholls, 1927)
Roughtail catshark.
Schroederichthys bivius (Smith, 1838)
Narrowmouth catshark (pintadinho).
Schroederichthys sp.
No common names.
Scyliorhinus besnardi Springer and Sadowsky, 1970
Polkadot catshark (oncinha).
Scyliorhinus haeckelii (Ribeiro, 1907)
Freckled catshark (oncinha).
Scyliorhinus sp.
Catshark (sarampinho).
Family **TRIAKIDAE** - Houndsharks
Galeorhinus galeus (Linnaeus, 1758)
Tope shark (bico doce, bico de cristal).
Mustelus canis (Mitchell, 1815)
Dusky smoothhound (cola fina, cação sebastião).
Mustelus fasciatus Garman, 1913
Striped smoothhound (cola fina, cação sebastião).
Mustelus schmitti Springer, 1940
Narrownose smoothhound (cola fina, cação sebastião).
Family **CARCHARHINIDAE** - Requiem sharks
Carcharhinus brachyurus (Günther, 1870)
Copper shark (cabeça chata, baleeiro).
Carcharhinus brevipinna (Müller and Henle, 1839)
Spinner shark (machote, galha preta).
Carcharhinus falciformis (Bibron, 1839)
Silky shark (lombo preto).
Carcharhinus leucas (Valenciennes, 1839)
Bull or Zambezi shark (cabeça chata).
Carcharhinus limbatus (Valenciennes, 1839)
Blacktip shark (galha preta).
Carcharhinus maou (Lesson, 1830)
Oceanic whitetip shark (estrangeiro, baia).
Carcharhinus obscurus (LeSueur, 1818)
Dusky shark (cabeça chata).
Carcharhinus perezi (Poey, 1876)
Caribbean reef shark (cabeça chata).
Carcharhinus plumbeus (Nardo, 1827)
Sandbar shark (galhudo, barriga d'água).
Carcharhinus signatus (Poey, 1868)
Night shark (machote).
Galeocerdo cuvier (Peron and LeSueur, 1822)
Tiger shark (tintureira, jaguara).
Prionace glauca (Linnaeus, 1758)
Blue shark (mole mole, focinhudo, tintureira).
Rhizoprionodon lalandi (Valenciennes, 1839)
Brazilian sharpnose shark (cação frango, bicudinho).
Rhizoprionodon porosus (Poey, 1861)
Caribean sharpnose shark (cação frango).
Sphyrna lewini (Griffith and Smith, 1834)
Scalloped hammerhead (vaca, martelo, cambeva, cambevota, pata branca).
Sphyrna mokarran (Rüppel, 1837)
Great hammerhead (vaca, martelo).
Sphyrna tiburo (Linnaeus, 1758)
Bonnethead shark (cambevota).
Sphyrna tudes (Valenciennes, 1822)
Smalleye hammerhead (cambevota).
Sphyrna zygaena (Linnaeus, 1758)
Smooth hammerhead (vaca, martelo, cambeva, cambevota, pata negra).

Order LAMNIFORMES
Family **CARCHARIDAE** - Sand tiger sharks
Carcharias taurus Rafinesque, 1810
Sand tiger shark (mangona).
Family **PSEUDOCARCHARIIDAE**
Pseudocarcharias kamoharai (Matsubara, 1936)
Crocodile shark.
Family **ALOPIIDAE** - Thresher sharks
Alopias superciliosus (Lowe, 1839)
Bigeye thresher (raposa, cação macaco, rabudo).
Alopias vulpinus (Bonnaterre, 1788)
Thresher shark (raposa, cação macaco, rabudo).
Family **CETORHINIDAE** - Basking sharks
Cetorhinus maximus (Gunnerus, 1765)
Basking shark (veiaco, zoiudo, cação bocudo).
Family **LAMNIDAE** - Mackerel sharks
Carcharodon carcharias (Linnaeus, 1758)
Great white shark (anequim).
Isurus oxyrinchus Rafinesque, 1810
Shortfin mako (anequim).
Isurus paucus Guitart and Manday, 1966
Longfin mako (mestiço).
Lamna nasus (Bonnaterre, 1788)
Porbeagle shark (anequim gordinho).

Order HEXANCHIFORMES
Family **HEXANCHIDAE** - Sixgill and sevengill sharks
Heptranchias perlo (Bonnaterre, 1788)
Sharpnose sevengill shark (cação leiteiro, cação de sete brânquias).
Hexanchus griseus (Bonnaterre, 1788)
Bluntnose sixgill shark (cação baia).
Notorynchus cepedianus (Peron, 1807)
Broadnose sevengill shark (tintureira, cação bruxa).

Table 1b: Check list of elasmobranch species landed in Itajaí harbor including systematic classification, common names in english and in portuguese (in parentheses).

Order SQUALIFORMES
Family **ECHINORHINIDAE** - Bramble sharks
Echinorhinus brucus (Bonnaterre, 1788)
Bramble shark (cação espinhudo).
Family **SQUALIDAE**
Centroscymnus cryptacanthus Regan, 1906
Shortnose velvet dogfish (cação negro).
Cirrhigaleus asper (Merret, 1973)
Roughskin spurdog (cação bagre).
Etmopterus bigelowi Shirai and Tachikawa, 1993
No common names (pretinho, cação preto).
Isistius brasiliensis (Quoy and Gaimard, 1824)
Cookiecutter shark (cação charuto, cação piolho).
Somniosus cf. *pacificus* Bigelow and Schroeder, 1944
Pacific sleeper shark.
Squalus acanthias Smith and Radcliffe, 1912
Piked dogfish (cação bagre pintado).
Squalus megalops (Macleay, 1881)
Shortnose spurdog (cação bagre, atinho).

Order SQUATINIFORMES
Family **SQUATINIDAE** - Angelsharks
Squatina argentina (Marini, 1930)
Argentine angelshark (cação anjo).
Squatina occulta Vooren & Silva, 1991
Angelshark (cação anjo).
Squatina guggenheim Marini, 1936
Angelshark (cação anjo).

Order RAJIFORMES
Family **TORPEDINIDAE**
Torpedo puelcha Lahille, 1928
Eletric rays (raia elétrica).
Family **NARCINIDAE**
Narcine brasiliensis (Olfers, 1831)
Eletric rays (raia elétrica, treme-treme).
Family **RHINOBATIDAE**
Rhinobatos horkelli (Müller & Henle, 1841)
Guitarfish (viola).
Rhinobatos percellens (Walbaum, 1792)
Guitarfish (viola).
Zapterix brevirostris (Müller & Henle, 1841)
Guitarfish (viola, cação duro).
Family **RAJIDAE**
Rioraja agassizzi (Müller & Henle, 1841)
Skate (emplastro).
Atlantoraja castelnaui (Ribeiro, 1907)
Skate (marcela).
Atlantoraja cyclophora (Regan, 1903)
Skate (emplastro).
Atlantoraja platana (Günther, 1880)
Skate (emplastro).
Diptururs sp.
Skate (raia bicuda, bicudinha)
Psammobatis bergi Marini, 1932
Skate.
Psammobatis extenta (Garman, 1913)
Skate (emplastro).
Psammobatis lentiginosa McEachran 1983
Skate (emplastro).
Psammobatis glandsimilis McEachran 1983
Skate (emplastro).
Sympterygia acuta Garman, 1877
Skate (emplastro).
Sympterygia bonapartei Müller & Henle, 1841
Skate (emplastro).
Family **DASYATIDAE**
Dasyatis centroura (Mitchill, 1815)
Stingray (raia prego espinhosa).
Dasyatis say (LeSueur, 1817)
Stingray (raia prego).
Dasyatis guttata (Bloch and Schneider, 1801)
Stingray (raia prego).
Dasyatis americana Hildebrand and Schroeder, 1928
Stingray (raia prego).
Dasyatis violacea (Bonaparte, 1832)
Pelagic stingray
Family **GYMNURIDAE**
Gymnura altavela (Linnaeus, 1758)
Butterfly ray (raia manteiga).
Gymnura micrura (Bloch & Schneider, 1801)
Butterfly ray (raia manteiga).
Family **MYLIOBATIDAE**
Aetobatus narinari (Euphrasen, 1790)
Spotted eagle ray (raia chita).
Myliobatis freminvillei LeSuer, 1824
Eagle ray (raia sapo).
Myliobatis goodei Garman, 1885
Eagle ray (raia sapo).
Myliobatis sp.
Eagle ray (raia sapo).
Family **RHINOPTERIDAE**
Rhinoptera bonasus (Mitchill, 1815)
Cownose ray.
Rhinoptera brasiliensis Muller & Henle, 1841
Cownose ray.
Manta birostris (Donndorff, 1798)
Manta ray (jamanta).
Mobula hypostoma (Brancroft, 1831)
Manta ray (jamanta).

double rig trawl) and upper slope (e.g. bottom longlines, bottom and surface gillnets). On the other hand, catches provided by surface longliners which targeted for swordfish were obtained principally in high seas (in some cases up to 800 nm from land, in waters of 4000 m depth) in a latitudinal range between 15ºS and 35ºS (Fig. 1).

In total, 23 families, including 1 chimaera (included in the list because its low

Tab. 2: Shark species landed in Itajaí harbor per fishing art. (Note: PS= purse seines; DR= double rig trawl; PT= pair trawl; SL= surface longline; BL= bottom longline; SG= surface gillnet; BG= bottom gillnet; TR= trap)

	Fishing art							
Species	P S	D R	P T	S L	B L	S G	B G	T R
Ginglymostoma cirratum								
Rhincodon typus								
Galeus arae								
Schroederichthys bivius								
Schroederichthys sp.								
Scyliorhinus besnardi								
Scyliorhinus haeckelii								
Scyliorhinus sp.								
Galeorhinus galeus								
Mustelus canis								
Mustelus fasciatus								
Mustelus schmitti								
Carcharhinus brachyurus								
Carcharhinus brevipinna								
Carcharhinus falciformis								
Carcharhinus leucas								
Carcharhinus limbatus								
Carcharhinus maou								
Carcharhinus obscurus								
Carcharhinus perezi								
Carcharhinus plumbeus								
Carcharhinus signatus								
Galeocerdo cuvier								
Prionace glauca								
Rhizoprionodon lalandi								
Rhizopriondon porosus								
Sphyrna lewinI								
Sphyrna mokarran								
Sphyrna tiburo								
Sphyrna tudes								
Sphyrna zygaena								
Carcharias taurus								
Pseudocarcharias kamoharai								
Alopias superciliosus								
Alopias vulpinus								
Cetorhinus maximus								
Carcharodon carcharias								
Isurus oxyrinchus								
Isurus paucus								
Lamna nasus								
Heptranchias perlo								
Hexanchus griseus								
Notorynchus cepedianus								
Echinorhinus brucus								
Centroscymnus cryptacanthus								
Cirrhigaleus asper								
Etmopterus bigelowi								
Isistius brasiliensis								
Somniosus pacificus								
Squalus acanthias								
Squalus magalops								
Squatina argentina								
Squatina occulta								
Squatina guggenheim								

Abundant	Frequent	Rare	Not caught

Table 3: Skate and ray species landed in Itajaí harbor per fishing art. Fishing art see Table 2.

	Fishing art							
Species	P S	D R	P T	S L	B L	S G	B G	T R
Torpedo puelcha								
Narcine brasiliensis								
Rhinobatos horkelli								
Rhinobatos percellens								
Zapterix brevirostris								
Rioraja agassizzi								
Atlantoraja castelnaui								
Atlantoraja cyclophora								
Atlantoraja platana								
Dipturus sp.								
Psammobatis bergi								
Psammobatis glandssimilis								
Psammobatis lentiginosa								
Psammobatis extenta								
Sympterygia acuta								
Sympterygia bonapartei								
Dasyatis centroura								
Dasyatis say								
Dasyatis gutata								
Dasyatis americana								
Dasyatis violacea								
Gymnura altavela								
Gymnura micrura								
Aetobatus narinari								
Myliobatis freminvillei								
Myliobatis goodei								
Myliobatis sp.								
Rhinoptera bonasus								
Rhinoptera brasiliensis								
Manta birostris								
Mobula hipostoma								

Abundant	Frequent	Rare	Not caught

presence in catches), 54 sharks, 11 skates and 20 ray species were identified. Their frequencies of occurrence in the different fishing methods can be found in Tables 1 and 2. Systematic listing of the species follows the order of classification of Nelson (1994). However, to classify the skates (i.e. Family Rajidae) it was used the work of McEachran and Dunn (1998). In the present study it was found a single species of chimaera (Chondrichthyes, Holocephali) that was included in the list. In Table 1 is presented the check list of elasmobranch species landed in Itajaí harbor (southern Brazil) including systematic classification, common names in English and, occasionally, in Portuguese (in parentheses).

The elasmobranch fauna landed in Itajaí harbor has revealed part of the all fish biodiversity off southern Brazil impacted by fisheries activities. This impact is apparently well noticed because of the decreasing elasmobranch fishery in southern Brazil, as reported by Haimovici (1997). However, this work was based mainly in demersal trawler fishery, where only a narrow group of species is caught. Therefore, in this case, a few species support a great fishing effort.

Bottom gillnets and trawlers caught a large number of species (Fig. 2), but only few

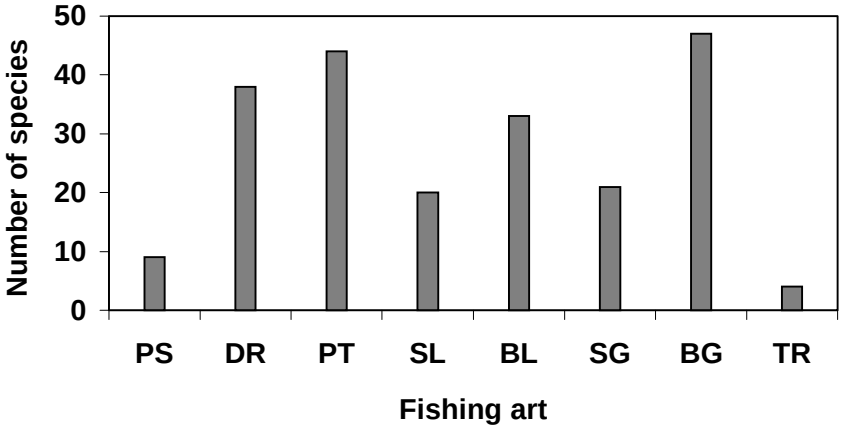

Fig. 2: Total number of species captured in each fishing art. Fishing art see Tab. 2.

species were abundant (Tab. 2 and 3). These arts, as well as longlines and surface gillnets were essencially multispecific in spite of lower number of species caught by them in comparison to the bottom gillnet and trawl. Purse seines and traps showed no significant capture of elasmobranchs.

In general, elasmobranch fishes do not have a good market price in Brazil. However, they represent a large proportion of captures not only as target species, but also as by-catch of others fisheries. The interest for elasmobranchs started because of the international demand for shark fins and skate meat. Almost 0.8% of all fishes species (in weight) captured in the world are elasmobranchs (Bonfil, 1994). In contrast, Haimovici (1997) noted that elasmobranchs captured off southern Brazil from 1975 to 1994 reached an average of 6128t.month^{-1}, i.e. around 10% (in weight) of all fish species captured in the same period. This value reveals the high importance of the elasmobranchs in Brazilian fisheries.

Data from Vooren (1995) suggest a typical pattern of elasmobranch fisheries: a period of high captures followed by a decline. Between 1984 and 1988 the amount of elasmobranchs landed increased as a result of the effort increase, decreasing after 1989. These data were originated mainly from trawlers that capture, as seen in Tables 2 and 3, a very distinct part of the elasmobranch fauna. Considering life history's characteristics of elasmobranchs (e.g. late maturation and low number of youngs), that results in a clear susceptibility to overfishing (Holden, 1974; Hoenig & Gruber, 1990), some restriction measures were adopted in Brazil in 1998. These measures were enforced to reduce gillnet effort only, but represented an initial step to a efficient legislation.

Some scientific data exists about the demersal shark fishery in southern Brazil, but the pelagic fishery has almost no information. Thus, is recommended the development of a more effective research program on elasmobrach fisheries, biology and ecology in southern Brazil.

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