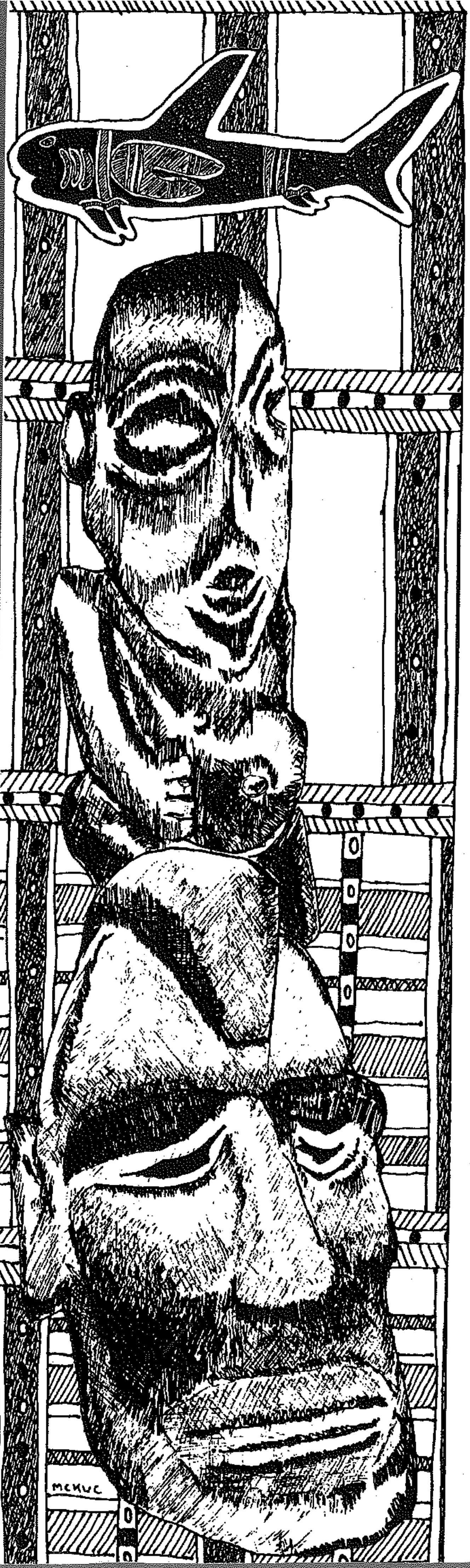

THE OCEANIA REGION'S HARVEST, TRADE AND MANAGEMENT OF SHARKS AND OTHER CARTILAGINOUS FISH: AN OVERVIEW

Edited by Glenn Sant & Elizabeth Hayes

TRAFFIC OCEANIA

TRAFFIC Oceania, Sydney, Australia.

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Preface

The TRAFFIC Network is a joint conservation program of World Wide Fur
and The World Conservation Union (IUCN). TRAFFIC Oceania is based i
area of responsibility for the Oceania region which includes twenty four cou

In 1993 the IUCN Shark Specialist Group met in Thailand and requested T
the trade in sharks and shark products globally due to a lack of information
conservation status of shark populations.

In November 1994, the parties to the Convention on International Trade o
of Wild Flora and Fauna (CITES) adopted Resolution 9.17: Status of Tra
resolution called on parties and international fishing organisations to provi
shark fisheries and trade for further discussion at the next Conference of the
A report will be produced by the CITES Animals Committee and distribute
consideration prior to the next Conference.

The TRAFFIC Network has undertaken a global investigation of the trade i
(Sharks, Rays and Chimaerids). Regional reports have been produced and T
has produced a global overview.

This report investigates the trade in chondrichthyans in the Oceania region
an overview of the trade in the Oceania region complementing the followin
Australia, New Zealand and the Solomon Islands. The first three chapters a
available information with the Solomon Islands chapter being a field investi

Elizabeth Hayes

1. Introduction and Background

The Oceania region consists of 24 countries and territories and covers a total area of ap square kilometres, most of which is ocean (Figure 1). Although the area of ocean is vas scale fisheries that specifically target chondrichthyans. Those that do are conducted pri New Zealand. The largest fishery in terms of annual catch is the southern shark fishery This fishery primarily takes catches of school shark (*Galeorhinus galeus*) and gummy shar which is consumed locally. Other smaller target fisheries include the fishery for carchar Australia, the West Australian shark fishery and the fisheries for rig (*Mustelus lenticulatu* New Zealand (Nichols 1993).

Many subsistence and small scale commercial fisheries for shark exist throughout the So Subsistence shark fishing is carried out by Polynesian, Micronesian and to a lesser exten The shark flesh is used for domestic consumption and teeth and jaws are commonly sol industry (Nichols 1993). Sharks form an important part of island culture in many coun poorly documented.

The change from subsistence to cash-based economies in many of the pacific island nat pressure on shark resources as deep sea fishing is encouraged to take the pressure off insl 1995). In many countries the development and placement of fish aggregating devices (catches over the past ten years. These enhance catches for both commercial operation operating a few miles off shore. As these devices attract fish they also attract large num the opportunity for artisanal fishers to exploit these sharks primarily for shark meat and for export. The most common gear used today includes the hook and line and pelagic methods are still employed in some areas eg. the use of a noose and rattle in Papua New Islands (Nichols 1993).

Sharks are commonly taken in the region as bycatch of the commercial tuna fishing in Japanese, Korean and Taiwanese longline and purse seine vessels operating throughout t the high seas and through bilateral access agreements with South Pacific countries. Th primarily for their fins, although some carcases may be retained (Nichols 1993). Large carried out in the South Pacific prior to 1991 by Japanese and Taiwanese vessels, Japan fishing in the area in 1990 but no current information on the activities of Taiwanese vessel

This study aims to present the available information on trade and management of chon Oceania region but it must be realised that data from much of the area is scarce. While Australia and New Zealand have relatively good recording systems, there are still discre form of misrepresentations of species and lack of information on discards and catches fr other areas of the South Pacific, few records may be kept and the majority of the shark from foreign vessels targeting high value species such as tuna which under-report catche Management effort is needed to quantify the actual catches in this vast ocean area whic ly given the relatively low economic value of chondrichthyans with the exception of th

he most common sharks inhabiting reefs and lagoons are members of the family
se species are the most important in subsistence and artisanal catches (Nichols 1993).
water reefs include, the blacktip reef shark (*Carcharhinus melanopterus*), lemon shark
hitetip reef shark (*Triaenodon obesus*). Species of Rhizoprionodon sharks are common
he high islands of Melanesia, whereas the common blacktip shark (*Carcharhinus lim-*
hark (*C. tilstoni*) and spot-tail shark (*C. sorrah*) are common in more open lagoonal
n wide continental shelves (Nichols 1993). In deeper water the grey reef shark
whaler (*C. albimarginatus*) and large species such as the tiger shark (*Galeocerdo*
s), Java shark (*C. amboinensis*) and several species of hammerhead shark (*Sphyrna*
hark (*Prionace glauca*) is also of commercial importance in the pacific where it is
ine and in pelagic and bottom trawls (Nichols 1993).

fshore waters and form part of the bycatch of commercial longliners and purse seine
tion and relative occurrence of each species from the observer programme of the
SPC) in the area of the South Pacific Ocean covered by the SPC (about 67%) from
n table 1. However, it must be realised that this information is based on low cover-
n and must be interpreted with caution.

nt common names being used for the same species in different areas, most species
be written with both the common name and scientific name. Where no scientific
ssumed that the species are as mentioned above.

production for the Oceania region.

roduction

hthyan catches is recorded by state and national governments of individual
e also recorded by the Food and Agricultural Organisation (FAO) across the
) data for fisheries of the Pacific Ocean ranks chondrichthyans as 18th in
ic region in 1990. This is a catch of 279 298 metric tonnes (mt) or 0.5% of the
of chondrichthyans is rising (Stamatopoulos 1993). Data on nominal catches of
ania countries was obtained from FAO statistics and is presented in table 2.

he South Pacific are Western Central (area 71,) Eastern Central (area 77) and
owever, these areas cover a greater portion of the ocean than the pacific island
resentative, they are however, useful for looking at trends in world production and
able 3).

(FAO area 71),chondrichthyans formed 0.91% of the total catch in 1990
orresponds to a total catch of chondrichthyans of 97 224 mt with a rising trend.

FAO area 77) chondrichthyans formed 1.4% of total catch in 1990, this amounts
ng countries ranked by 1990 production of chondrichthyans include the Cook
e catch (Stamatopoulos 1993).

area 81). New Zealand

The South Pacific Forum Fisheries Agency (FFA), serves the area of the western centra
(corresponding to FAO areas 71 and 81), and in 1987 recorded commercial shark catch
approximately 12% of the recorded shark catch for that year and hence this region is of
importance in terms of contribution to world catches (Nichols 1993). However, it must
commercial catch data is not a reliable estimate of the total removals from the sea (Nich
degree of discarding and under reporting.

3.2 Country specific production for the Oceania region

This section aims to provide a brief description of existing information on shark fisherie
nations. This is obviously not an exhaustive list of the countries. As most have little in
fisheries or little information on shark catches, the information is limited. New Zealand
Western Province of the Solomon Islands are covered in more detail in latter sections o

Fiji

Fiji comprises approximately 844 islands and islets, about 106 of which are inhabited. It
Economic Zone (EEZ) covers 1.26 million square kilometres (Adams et al. 1995).

Shark is not consumed in many areas of Fiji due to traditional taboos on its use, howeve
the Rotum and Rabi communities. There is an international trade in dried and frozen s
bycatch of the pelagic longline fishery and Fiji is a significant exporter of shark fin (Tab
largest importer of shark fin and Fiji exports significant quantities of product to this ma
Production figures for shark fin in Fiji were obtained from FAO statistics (Table 6) and
discrepancies in the figures, it can be seen by comparison with table 4 that the majority
ed. A small amount of shark from the longline catches (mainly mako) is exported to Ja
1987 experimental fishing for squalene (oil found in the liver of sharks) rich deep water
Fijian waters under the direction of the Fiji Fisheries Division (Richards 1994). Increas
may increase the catches of sharks.

Whaler sharks (Qio) are the most common species recorded in Fiji waters. In dropline
by the South Pacific Commission (SPC), 2 species were recorded as bycatch: the white-
albimarginatus) and the grey reef shark (*C. amblyrhynchos*). Other species recorded are t
(*C. melanopterus*), the white-tip reef shark (*Triaenodon obesus*), lemon shark, tiger shark
substantial amount of blue shark is taken by longline vessels in Fijian waters, in 1994 a
0.4% of the longline catch was made up of blue shark (Anon 1994).

A total of 2.16 mt of shark was sold through the municipal markets in 1994, the majorit
kets in the western division. A further 0.86 mt was sold through non-municipal markets
butchers, supermarkets and hotels, the majority of product is sold through roadside stall
sharkfin was sold through non-municipal markets, this product was sold through butche
northern division. The price of shark varies through the divisions but the average price
(Anon 1994). No prices were recorded for shark fin in 1994. The teeth of tiger and ma
to make jewellery while the jaws are dried and sold as curios (Richards 1994).

Shark exports in 1994 included 1.5 mt of "dogfish and other sharks - fresh or chilled" and 81
worth US$50 504 and US$705 619 respectively. Thirty tonnes of sharkfin was exported fro

d atolls. There is approximately 1.3 million square kilometres of ocean within the
helf area (Skewes 1990).

ence and small scale artisanal fishers in some areas of the Solomons, generally as a
water bottom fish or of tuna purse seining (Skewes 1990). Subsistence fishers eat the
fin is sold to local or Honiara based traders for export (Table 4). Shark worship has
in the Solomon islands and still continues on some islands (Nichols 1993). Local
t shark for domestic consumption especially in the Wagina area in the Western
detailed report of the trade and utilization of sharks in the Western Province is pro-

d mainly of Carcharhinid sharks, the inspection of the catch from a shark longliner
ne catch was made up of Carcharhinus spallanzani (Skewes 1990). In 1984 and
targeted sharks in the Solomon Islands primarily for hides and also for fins and
nt of fins during this period. An average catch rate of about 60 sharks per night was
126 (Nichols 1993). In 1987 a single vessel started exploratory fishing for deep water
droplines and longlines. Catch rates are reported to be about 250 sharks per day, of
ichols 1993). Livers are removed from the carcases at sea and brought to shore
ed out. Production to 1993 had been on average 2 500 kg per year, all of which was
993). Imports of liver oil to Japan were obtained for 1989 to 1992 and show a peak
.

l legislation on sharks.

ists of 32 coral atolls in 3 main groups, and 1 isolated island. The land mass is
ion square kilometres of ocean. The total area of the EEZ is 3.6 million square kilo-
The people of Kiribati have in some parts traditionally credited the shark with
man (Nichols 1993). In the Line Islands of Kiribati, the shark plays a leading role in
d to be the most important of all the fish spirits.

e up only 3.4% of the total artisanal fisheries landings in Kiribati with catches only
anuka (Anon 1995). However, artisanal surveys of the outer islands in 1989
caught on 5 of the 7 islands surveyed, these included, Kuria, Aranuka, Tamana,
anuika and Arorae the catches were 9.4 and 12.3 % of the catch respectively
surveys of South Tarawa were conducted during February, June and November of
obranchs as constituting 4.8, 0 and 0.1 % of the total catch respectively (Anon

sed to fish in the EEZ of Kiribati, in 1989 these included Japan, whose pole and
ve permission under a bilateral agreement, and Korea whose longline fleet has per-
eral fisheries treaty with the USA which includes Kiribati, allows the operation of
EZ and longliners from American Samoa operate in Kiribati waters (Anon 1989a).
nificant proportion of sharks as bycatch. There is substantial foreign interest in the
i, export quantities between 1980 and 1989 have fluctuated from a low of 900 kg
n 1984 (Table 4).

The Republic of Vanuatu consists of over 80 islands with an EEZ covering 848 000 square
(Dalzell 1992).

The Overseas Fishery Cooperation Foundation (OFCF) project undertaken between 198
several species of shark in waters of Vanuatu including: the cat shark (*Scyliorhinus torazar*
(*Sphyrna sp.*) and shortspine spurdog (*Squalus mitsukurii*). The silver tip shark (*Carcharh*
identified during SPC bottom fishing expeditions (Dalzell and Preston 1992).

Shark is currently a bycatch of the deep reef slope fishery, the main artisanal fishing acti
1992). Although some fishers specifically target shark for commercial sale, shark makes
of the catch (Dalzell and Preston 1992). Shark meat is marketed commercially in the lo
Vila and a substantial amount of shark fin is exported (Table 4). Shark fin exports are
occurred up to 1989. Catches from fishing trials conducted by Fisheries Department ves
showed sharks to comprise 9.6% and 16.06% of catch by weight respectively. The only
sales is from the Natai fish market from 1988 to 1992, shark purchases for this period ra
to 1 289 kg in 1991 (Table 8). No information is available on the status of the shark sto
Amos 1993).

Mako sharks are important to sport fishing in Vanuatu (Nichols 1993). Some fishers us
to catch sharks as a hobby (Bell and Amos 1993).

There is no existing legislation or policy regarding the exploitation of sharks in Vanuatu

Tonga

The Kingdom of Tonga consists of approximately 150 islands and islets of which 36 are
spread over an ocean area of approximately 360 000 square kilometres (Adams et al. 19

A two-year fisheries project during 1980 and 1981 identified the following species in To
(*Carcharhinus amblyrhynchos*), white-tipped reef shark (*C. Albimarginatus*), black tipped
(*C. Melanopterus*), great white shark (*Carcharodon carcharias*), scalloped hammerhead (
mako shark (*Isurus oxyrinchus*) and tiger shark (*Galeocerdo cuvieri*). The white-tip shark
shark (*Prionace glauca*), and thresher shark (*Alopias pelagicus*) have also been identified

Fishing has always been an important subsistence activity in Tonga. Traditionally, shark
to the fish portion of the diet, especially on the outer islands (Bell et al. 1994). Sharks
where a shark is enticed alongside a boat with a coconut rattle, bait is then thrown in a
the bait a noose is slipped around the shark and it is dragged on board. Modern metho
sist of a hook and length of chain attached to a nylon rope and floats. At the subsisten
hand lines, gill nets and spear fishing are the main methods by which sharks are caught
shark at Vuna and Faua in Nuku'alofa in the 1993 artisanal fishery were estimated at 3
of ray for the 12 month period, this is 0.09 and 0.03 % of the total finfish landings resp
There has been no stock assessment of the shark resource in Tongan waters.

There is currently no regulation or policy dealing specifically with the shark resource.

Cook Islands

ased with the increasing incidence of fishing around FADs. Shark flesh has report-
ood shops in Rarotonga for US$4.47 per kilogram and interest has been expressed by
in exporting shark fins (Anon 1993a).

nducted in Cook Island waters by the South Pacific Commission found sharks to
y number and 15.2% by weight. Species of shark recorded from these surveys were:
albimarginatus), grey reef shark *(C. amblyrhynchos)*, blacktip shark *(C. melanopterus)*
enodon obesus). The silky shark *(Carcharhinus falciformes)* and hammerhead shark
recorded. (Dalzell and Preston 1992). In 1978 and 1979 there was 3.8 tonnes and
nd rays respectively in the southern Cook Islands which was 0.5 and 3% of the total
Anon 1980).

ing the catching of sharks in the Cook Islands.

l Islands (RMI) consists of a double chain of coral atolls comprising 34 islands and
he countries EEZ is 2.13 million square kilometres (Adams et al. 1995).

throughout the islands from the reef to offshore areas. Although a variety of
consists largely of Carcharhinid sharks (Smith 1992).

stence resource and are taken as bycatch of the tuna longline fishery. Japanese, Taiwanese
te in the Marshall Island EEZ fishing for tuna with a bycatch of sharks. Annual catches of
panese fishing vessels are recorded from 1987 to 1991 and peak at 28.3 mt in 1990 (Table 9).

hark fin was listed as being exported from the Marshall Islands. In 1992 there was
on Majuro and selling to a New York based company. Fins from all species were
wanese longliners. Dried fins were receiving US$16/kg for oceanic species and
ith 1992).

deep slope fisheries targeting predominantly snappers *(Lutjanidae)* and groupers
ropline fishing survey conducted by the South Pacific Commission in 1991 lists
the total catch by number and 48.9% by weight (Dalzell and Preston 1992).

on directly related to shark fishing.

ronesia

onesia is composed of the four states of Kosrae, Pohnpei, Chuuk and Yap and has an
e miles. The states manage their 12 mile territorial waters and the national govern-
n fishing in the EEZ (Smith 1992a).

try's largest natural resource, however, little information is available on shark
ly of Carcharhinid sharks and commercial fishing is for fins only. Sharks are caught
slope species which targets snappers. In a line fishing survey by the SPC in 1991,
catch by number and 21.2% by weight (Dalzell and Preston 1992).

e resource in Kosrae and on the Fais Island in Yap State. Sharks are also caught as a
nd purse seine fisheries but no information on catches is available (Smith 1992a).

Papua New Guinea has a total land area, including mainland and islands, of approximate
metres. Its 200 nautical mile Declared Fishing Zone (DFZ) covers 2.3 million square kilor
Pacific Ocean (Anon 1989b).

Small quantities of shark were caught by artisanal fisheries prior to 1980 (Stevens 1993).
began fishing in the Gulf of Papua following a gillnet survey conducted during 1977, catc
able for 1981 and 1982 when 810 and 405 mt of shark was caught respectively. Some exp
meat from 1981 to 1986 are available and show PNG exports to Taiwan to range from a h
to a low of 45 mt in 1986 (Table 10). In 1980-81, five vessels operated in the Gulf and
in 1982 and in 1990, 2 gillnetters were fishing (Nichols 1993).

Mako sharks are important to sport fishing in PNG (Nichols 1993).

Palau

There are approximately 340 islands in the Republic of Palau, with a total land area of 5
The extended fishing zone of Palau covers approximately 600 900 square kilometres of oc

Palau has an abundant and diverse population of sharks, however no commercial catch c
(Nichols 1991). A shark fishing survey carried out by the South Korean fisheries researc
agency in 1975 found hammerheads, milk sharks, white-tip reef sharks and sand sharks (
ed) to be the most abundant. No commercial fishery targeting sharks has developed. A
in either fish production statistics or export statistics.

There is no legislation in place relating to sharks.

Tokelau

Tokelau is comprised of three atoll islands and the islets extending from them. It has a l
kilometres and an EEZ of approximately 290 000 square kilometres (Adams et al. 1995)

Shark fishing is generally carried out by older men in Tokelau who use nylon lines with
They anchor on the reef and drift over deeper water. Catches of up to 50 sharks a night
fishermen (Nichols 1993).

4. Conclusions and Recommendations

The Pacific Ocean has had steady and continuing growth in chondrichthyan catches in
1980s while catches in the Atlantic - Mediterranean peaked in the late 1960s and decli
The South Pacific area accounts for approximately 12% of the world's total shark catch
Population growth is high in many Pacific countries and as nearshore marine resources
species such as sharks may come under increasing pressure. Catch data by FAO areas h
trend in shark catches and there is now an increasing need for monitoring. As the SPC
nations to develop their deep water fisheries it should be a priority of organisations such
collecting activities for sharks and provide educational assistance to Pacific Islanders to
... and keep accurate records of catch rates.

heries in Australia and New Zealand however, there is no management of the shark countries at this time. The difficulty of monitoring and the limited research funds isheries administrations of many South Pacific countries has constrained these Management will become important as these resources are increasingly targeted. re is a need for data collection so species composition and catch rates may be identified es are subject to the highest levels of exploitation. However, western style management r South Pacific countries, management strategies that take into account traditional have been in existence for hundreds of years, may be more appropriate (Sant 1995).

information are readily available for Australia and New Zealand as a result of their However, for South Pacific nations catch and trade information is scant. Furthermore, customs services and fisheries administrations are not optimally exploited in the South ecord keeping may be poor. However, some shark fin export statistics are available and import statistics for Hong Kong (the largest importer of shark fin) give an indi- exports of shark fin.

rs sharks are commonly taken as bycatch of commercial tuna longline and purse seine , Taiwanese and Korean vessels (Stevens 1993). There are also several large scale fish- seas which are known to take a substantial catch of elasmobranchs, particularly sharks Pacific countries have proclaimed EEZs, and have agreements which allow other ers, the opportunity exists to introduce programs for monitoring catches of sharks by tinely compiles catch and effort data for fishing activities including Japanese longlin- ember countries (Ward 1996). Observer programs do operate in some areas, for bati, Fiji, the Solomon Islands and New Caledonia, but they are based on low cover- nd should be extended. The amount of elasmobranchs killed in high seas fisheries is corded does not include that portion of the catch dumped at sea (Bonfil 1994). e retained the majority is believed to be dumped and depending on the gear used, is es may give sharks the greatest chance of survival, however, many sharks may have he discarding of the rest of the carcass. Some estimates of the total bycatch of sharks made using figures estimated from Strasburg (1958) (Bonfil 1994). These indicate 1 sharks or 40 434 mt were caught in 1989. Total discards were estimated to be majority of the catch and also has the highest discard rate (Bonfil 1994).

(Prionace glauca) caught outside of EEZs are finned and the carcases discarded. are likely to be relatively productive they are undoubtedly being caught on a massive est Pacific (Stevens 1993). The high quality of the mako sharks especially the short- makes them an important bycatch in tropical tuna longline and gillnet fisheries. ncidental catches of shark are taken by the tuna fisheries, the south east trawl fish- ry in particular (See chapter 2). Similarly, sharks are taken (particularly blue and Japanese longline operations in the New Zealand EEZ (See chapter 3). If current nent operations of shark products from Asian longliners targeting tuna in the South oceanic shark resources in the region will be subject to increased fishing pressure in

a great deal of variability in exports of shark and shark products for Pacific coun- ports are rising, a good example of this is shark fin exports from Fiji. Increased to ascertain quantities of meat and shark products exported, especially shark fins.

1. Data on shark catches should be collected by local fisheries offices or community l for subsistence, artisanal and commercial fisheries. These would be used to asceria species composition.

2. There should be mandatory reporting of shark bycatch by fisheries which tend to l catch of sharks ie. tuna longline fisheries.

3. A shark bycatch code of practice should be developed for tuna longline vessels op Pacific. This code of practice should require:
   - that sharks be released alive and undamaged where possible;
   - that where fins are retained trunks must also be retained.

4. Better reporting facilities should be developed and detailed export data including should be kept by the relevant departments.

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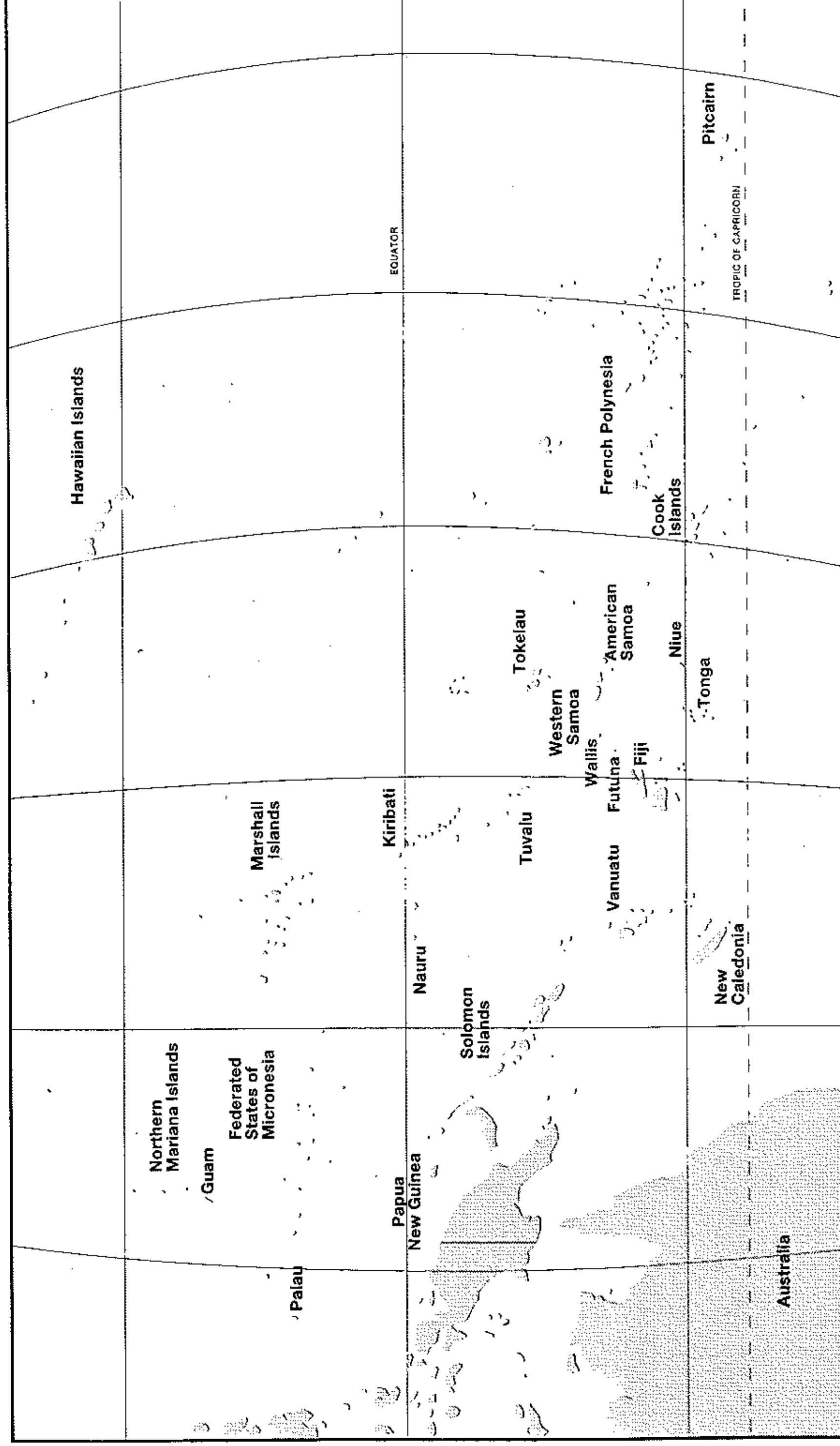

e	Scientific name	WTP	Area WSP	WTeP	Retained
hark	*Carcharhinus malanopterus*				
	Carcharhinus limbatus	R			
	Prionace glauca	A	A	S	N
	Carcharhinus brachyurus		S	C	Y
	Pseudocarcharais kamoharai	C	S		N
	Symnodon sp.;Squalidae		R	R	N
rk	*Carcharodon carcharias*		R	R	Y
	Carcharhinus amblyrhynchos	S	S		
hark	*Sphyrinus* sp.	S	S		
	Isurus oxyrhinchus	S	C	S	Y
	Mobulidae	R	R		N
o	*Carcharinus longimanus*	C	C		Y
	Lamna nasus		C	C	N
	Galeorhunus galeus		S	S	Y
	Carcharhunus falciformis	A	C		Y
	Carcharhinus albimarginatus	C	R		Y
hark	*Etmopterus pusillus*		R		N
	Dasyatis sp.	A	C		N
	Alopias sp.	C	C	S	Y
	Galeocerdo cuvier	R	S		N
ark	*Triaenodon obesus*				

ropical Pacific
ubtropical Pacific
Temperate Pacific

ant in the longline catch for this area; at least 1 per set
en; usually at least 1 taken every 10 sets
aybe 1 per year or one occurrence ever

Country	1984	1985	1986	1987	1988	1989
Aust	7138	7521	10596	13528	14195	11861
Cook Is	31	32	33	34	34	36
Kiribati			429	2540	447	2010
NZ	11466	11098	8309	8100	8564	10238
Samoa	20	20	20	20	10	0
Soloman Is				4	2	5

Table 3. Nominal catches (mt) of sharks, skates, rays etc by FAO fishi
Pacific.Source: FAO fisheries statistics.

Pacific - Western central. FAO area 71

	1986	1987	1988	1989	199
liveroil sharks	2833	2833	2833	2850	285
skates & rays	34387	37867	41933	44067	4301
sharks, rays, skates etc	40874	42984	41342	50705	5033

Pacific - South west. FAO area 81

	1986	1987	1988	1989	199
Requeim sharks	2945	2114	2312	2406	252
smoothhounds	1749	1215	1522	1559	164
dogfish sharks	1671	3708	6036	4351	436
skates & rays	964	1212	1872	1501	203
elephantfishes	1072	1294	1493	1060	184
sharks,skates,rays etc	5639	6181	7601	3803	440

Pacific - Eastern central. FAO area 77

	1986	1987	1988	1989	199
Requeim sharks	5777	5292	6546	6484	940
dogfish sharks	4	24	2		
skates & rays	571	888	1948	1622	168
sharks,skates,rays etc	17694	16965	20919	17812	1939

Year		Country: Solomon Is.	Fiji	Vanuatu	Kiribati
1980	Qty(kg)	n.a.	53700	10700	1100
	value (US$)	n.a.	272260	59950	14570
1981	Qty(kg)	n.a.	41600	14000	900
	value (US$)	n.a.	213300	71520	11500
1982	Qty(kg)	n.a.	14500	5000	1600
	value (US$)	n.a.	73540	25910	23010
1983	Qty(kg)	n.a.	7700	9000	900
	value (US$)	n.a.	41650	47220	13800
1984	Qty(kg)	n.a.	8000	22000	3000
	value (US$)	n.a.	43260	46000	37580
1985	Qty(kg)	n.a.	10820	11000	1800
	value (US$)	n.a.	73140	70570	26840
1986	Qty(kg)	n.a.	8320	5000	1100
	value (US$)	n.a.	57020	15170	16870
1987	Qty(kg)	4456	6330	n.a	1000
	value (US$)	53770	29960	n.a	12270
1988	Qty(kg)	2073	25000	3000	1200
	value (US$)	40990	n.a	n.a	13800
1989	Qty(kg)	4931	14000	n.a	2000
	value (US$)	63306	n.a	n.a	32210
1990	Qty(kg)	1923	24000	n.a	n.a
	value (US$)	33390	129792	n.a	n.a
1991	Qty(kg)	3073	21730	n.a	n.a
	value (US$)	98005	117864	n.a	n.a
1992	Qty(kg)	6678	69000	n.a	n.a
	value (US$)	n.a	367632	n.a	n.a
1993	Qty(kg)	n.a	65600	n.a	n.a
	value (US$)	n.a	n.a	n.a	n.a
1994	Qty(kg)	n.a	30000	n.a	n.a
	value (US$)	n.a	n.a	n.a	n.a

	Oceania nes.	TTPI	Kiribati	Tuvalu	Tonga	Western Samoa	Nauru
1980	9490			540	3000	83300	
1981			40			36550	
1982	4190	50				11760	
1983						2820	30
1984	7519					290	
1985	11680						
1986	14080						
1987	1790		170			3300	
1988	6913	202	169			32877	
1989	9887		210			48300	
1990	36830		650			43160	
1991	56820					28360	
1992	50260		280			26450	
1993	13710		2500			10500	
1994	26890		1630		190		
1995	21581		7620		343	1800	410

Table 5b. Value of shark fin (US$) imported into Hong Kong from coun
Source: Hong Kong Trade Statistics, Imports and Exports.

	Oceania nes	TTPI	Kiribati	Tuvalu	Tonga	Western Samoa	Nauru
1980	71663			9646	33807	782690	
1981			560			349318	
1982	40318	494				182198	
1983						35699	732
1984	74035					2170	
1985	119348						
1986	147488						
1987	38657		2208			46034	
1988	177651	3305	3545			785127	
1989	200015		3127			1052173	
1990	639074		15954			918145	
1991	968833					698162	
1992	1039766		10852			1030464	
1993	378893		111044			387037	
1994	779014		114245		7763		

Year	Fins (kg)
1983	8000
1984	8000
1985	11000
1986	10000
1987	6000
1988	25000
1989	14000
1990	24000
1991	21000
1992	69000

ark liver oil imports (kg) to Japan from the Solomon Islands, 1989 - 1992.
urce: Japanese trade statistics, Imports and Exports.

	Solomon Is
Year	Qty (kg)
1989	2890
1990	3570
1991	5100
1992	7650

nual quantity (kg) and value of shark purchased by the Natai market, Vanuatu.
rce: Bell and Amos 1993.

Year	Quantity (kg)	Value (US$)
1988	1138.6	588
1989	725.5	460
1990	851.8	547
1991	1289.7	1129
1992	758.9	688

Year	Catc
1987	
1988	8
1989	
1990	2
1991	4

Table 10. Export of shark meat (mt) from Papua New Guinea to Taiw
Source: Paul Nichols, from Stevens 1993.

Year	Quan
1981	4
1982	4
1983	8
1984	1
1985	1
1986	*

* 1986 data for January to May only.

1. Historical Perspective

Chondrichthyans are an increasingly important resource for Australia's fisheries. ally been an important part of the diet of coastal Aborigines and Torres Strait Isl However, at the beginning of European occupation in the 1800s, whaling and seal duction. The commercial fishery for school sharks (*Galeorhincus galeus*) began in immediately after European settlement, but it was not until the 1920s that fishers catches became significant (Kailola et al.. 1993). With the increase in technolog century more species, especially those offshore, became exploited. The Victorian of gummy shark (*Mustelus antarcticus*), and continued to dominate chondrichthya However its relative importance declined with the development of other domesti south-west Western Australia, as well as fisheries based on foreign fleets. The cat gillnetting vessels operating in northern Australian waters from the early 1970s ti domestic fishery.

The incidental catch of chondrichthyans began to increase during the 1960s and fishing activities, particularly towards trawling. Prawn trawl fisheries developed i Western Australia and Queensland, and fish trawling expanded in the southeast. Australian Fishing Zone (AFZ), the area of sea within 200 nautical miles of the c trawl fisheries have developed. The South East Fishery which is mainly dominate the biggest Australian fishery in terms of tonnage. The chondrichthyan bycatch significant and may presently be as large as the total targeted catch.

From 1987-1991, elasmobranch (shark and ray) fisheries represented 4.8% of all c highest percent importance in the world (Bonfil, 1995). Despite this, Australia c elasmobranch catches (1987-1991, Bonfil 1995). In comparison to its neighbour sharks and rays is the largest in the world and is approaching 80,000 t per year, A in the late 1980s at just over 10,000 t.

2. The Australian Chondrichthyan Fauna

In this section an overview of the Australian chondrichthyan fauna is given alon the species of major economic and/or conservation concern. Last and Stevens (1 guide to the chondrichthyan fauna of Australia and most of the information in th work.

Australia has an extremely rich chondrichthyan fauna consisting of at least 296 s ic; rays (73%) and sharks (48%). Of the rest, 20% of the ray and 21% of the sha Indo-Pacific. Only 7% of ray and 29% of shark species found in Australian water

A wide range of habitats are inhabited by chondrichthyans. Most rays are demers slope (90%), although some species are coastal pelagic or oceanic (8%). A simil

...gy of the individual species and at

form the dynamics of an exploited population can be thought of as a pool with various inputs and e 1). The growth of each individual and the recruitment of young, increase the total weight of the l mortality (through predation and disease) and fishing catch reduce it. In order to asses the of a particular level of catch, it is useful to consider the relative magnitude of growth, recruitment ortality. For example, populations with lower mortality rates will be able to sustain higher catches, qual.

lay techniques in population dynamics incorporate characteristics such as growth rates, mortality -recruitment relationships. Unfortunately there is little information available on these traits for thyans, especially deepwater species. Determination of growth rates often requires tagging or agech can be both expensive and time consuming. In contrast, basic biological information such as mals live at, litter sizes, gestation period and size of maturity is available for many species. Hoenig 90) suggested that basic biological characteristics could be useful in estimating the relative suscep- s to over-exploitation. Without information on the population dynamics of a species, based on characteristics such as habitat or litter size represents a means of providing some assess- uctivity. The importance of such life history traits in determining the relative productivity of variation in the Australian fauna are discussed below. These traits are used in identifying species ervation concern. Table 1 lists traits for most species of major economic and/or conservation alia.

of chondrichthyans are generally considered to be slower than most other exploited species. l as a major cause of the low productivity of chondrichthyan fisheries. Growth rate is often e Brody growth coefficient (K), although the age and size at which sexual maturity is reached dication of its magnitude. In general chondrichthyans living in colder or deeper areas have . A tropical inshore shark species would be expected to have a higher growth rate than one temperate waters. However, there is a quite wide variation within the group and such generali- ays hold.

spurdog (*Squalus acanthias*) is not exploited to a great extent in Australia but is closely related g which is often caught as trawl bycatch. It is very slow growing, not reaching sexual maturity . Age estimates of up to seventy years have been made. This is particularly surprising for a hes a maximum size of only about 160 cm and lives in relatively shallow waters. Nonetheless ported large fisheries with world wide catches totalling up to 43 600 t per year (Compagno n sharks are another inshore species with slow rates of growth. Males reach sexual maturity of) years and females 85-90 cm in 11-14 years.

e family there can be large variations in growth rates. For example, the tropical ot-tail shark and the Australian blacktip shark reach sexual maturity in 2 to 3 and 3 to 4 owever the closely related, but more temperate sandbar shark matures at about 13 years in and lives for at least 30 years.

will not as drastically change their numbers. In general, species with greater litte resilient to exploitation.

The long gestation period and time to sexual maturity in chondrichthyans mean between the implementation of management controls and an observable effect or effect on recruitment of the fishery for dusky sharks in Western Australia is still n years of operation. The fishery exploits individuals less than a year old and the sp years to mature. Therefore it is only now that the direct effects of fishing on recr

Natural mortality

Direct estimates of mortality are available for only a few shark species. School sh estimated mortality rate of 13% per year; porbeagle, 16% and spiny dogfish, 9%. indirectly from longevity data. Sharks are among the longest lived fish, suggestin spiny dogfish has an estimated longevity of 65-70 years suggesting both low morta

Population Structure and Species Distribution

The population structure of a species is important in determining its susceptabilit populations are generally more susceptible than those that are spread over a wide species is most appropriately managed at the level of a population.

Unfortunately the population structure is unknown for most chondrichthyan spec species distribution. For species that are endemic, only exploitation within Austr However, in the case of more widespread species, caution must be taken when ass single population local exploitation may be insignificant compared to that elsewh distribution made up of several small populations, local catches may be the major sustainability of the fishery.

Examples of the influence of life history traits on productivity

The effect of life history traits in determining the susceptibility of species to overf Australia's largest target shark fishery, the Southern Shark Fishery. There are two gummy shark and the school shark. Both belong to the same family and they hav ties. However in the last 10 years there has been a reduction in the catch of scho increasing concerns over the sustainability of this component of the fishery.

School sharks have low rates of both mortality and growth. They have a lifespan 1992) and a natural mortality rate of about 10% per year. Estimates of the Brody 0.16, low even for sharks. Females mature at about 130 cm in 8 to 10 years. Alth number of young, these factors combine to make school sharks relatively unprodu widespread distribution and are exploited elsewhere. However, evidence from tag gle stock in southern Australia. Although several trans-Tasman migrations of tagg may be at least some mixing with stocks in New Zealand (McGregor 1994), the e Australian waters is of primary concern to the sustainability of the local fisheries.

...gummy sharks have been caught in similar quantities in the same fishery, their differ-
traits has resulted in different responses to this exploitation. However in both cases, assesments of
e made relatively easily because of the relatively restricted distribution of their populations. For
tributed populations, exploitation in other countries may need to be considered.

s similar to the gummy shark in that it has relatively high rates of growth and natural mortality.
ears to mature to about 220 cm and has relatively large litter sizes. It is therefore expected to be
igher levels of exploitation than other shark species. However, unlike the gummy shark it is a
es and is thought to have stocks which cover very large areas. While the current levels of
alian waters may be sustainable, there is evidence that the same stock is being heavily exploited

llustrate how certain species can be identified as being more susceptible to overfishing. A sim-
f the harvest levels of each species is meaningless unless it is accompanied by a knowledge of the
nilarly, considering the level of exploitation within Australian waters may only be useful if that
oited elsewhere. A knowledge of their distribution and stock structure is necessary.

traits to predict the productivity of some Australian chondrichthyans.

pecies has been given a rank score as to their relative productivity. Those with the highest
oitation have been given a score of 1. Where there is insufficient information to make such an
ecies has conservatively been given a score of 2. Species which have stocks which are unlikely
ort large fisheries have been given a score of 3. Due to a lack of information for many species
cessarily subjective and are often based upon a knowledge of closely related species. This
he view of Hoenig and Gruber (1990) who concluded that such comparative approaches are
but they are surely better than nothing".

ed solely upon the biology of the species and do not take into account current levels of
rmining whether a particular level of harvest is sustainable is a complex procedure beyond the
. Assesments made by relevant fisheries research organisations are considered below with
ery.

sheries

oitation is summarised by fisheries. This format is most useful in formulating management
or each fishery. A summary of the relative importance of each fishery to the conservation of
n in Section 6.

e fisheries are divided up into different management sectors. For instance the now defunct
hery in northern Australia is included separately from the current Northern Shark Fishery.
d the same species and probably the same stocks as present day Australian shark fisheries it
ifferently, under different jurisdictional control.

tates and territories, Queensland (Qld.), New South Wales (NSW), Victoria (Vic.),
th Australia (SA), Western Australia (WA) and the Northern Territory (NT). According
nstitution, state governments have control over waters 3 nautical miles (nm) from the coast.
tion over fisheries within that area. The Commonwealth government has jurisdiction over
the edge of the Exclusive Economic Zone (EEZ), 200 nm from the coast. The state govern-
onsible for fisheries are Queensland Fisheries Management Authority, NSW Fish...

This system has caused problems in the management of stocks which occur in bo...
To overcome these problems the Offshore Constitutional Settlement (OCS) has b...
exchanges of power of authority over fisheries, between the Commonwealth and t...
are now in place for most of Australia's major fisheries but many are new. Negoti...
Fishery were not finalised until February 1995 and are still under way in NSW.

3.1. Subsistence

Currently in Australia the capture of chondrichthyans for personal food is insignif...
commercial operations. Such fisheries are also difficult to separate from those wh...
present only a small proportion of non-commercial fishers target sharks for food pu...
and rays have been an important food source for indigenous Australians, particular...
The blacktip reef shark (*Charcharinus melanopterus*) is caught off northern Australi...
and usually prepared as buunhdhaarr. This involves boiling the liver and flesh sep...
mixing then together (Last and Stevens 1994).

3.2 Commercial

3.2.1 Domestic
3.2.1.1 Directed

3.2.1.1.1 Southern Shark Fishery

The information for this section was drawn from T. Walker, in litt. (1995), Walke...
McLoughlin and Walker (1994) and Kaiola et al.. (1993).

Definition

All species of demersal shark taken commercially by demersal gillnet and demersa...
the NSW/Vic and the SA/WA borders except in Victorian state proclaimed water...

Methods

Traditionally most of the catch in the Southern Shark Fishery (SSF) was taken us...
However during the 1960s gillnets began to dominate, and in 1994, 86% of the c...
method. Longlines consist of a mainline with snoods about 1m long attached at i...
snood has a single 10/0 short shank or 11/0 long shank Mustad hook. Baits used i...

Gillnets are more efficient at catching gummy sharks but cannot be used in strong...
the continental slope and are more expensive to purchase and maintain. They co...
monofilament net anchored and buoyed at each end. After their introduction in...
gillnets increased from around 140 mm to 178 mm. However following the ban o...
in Victoria there was a rapid decrease to around 152 mm. Even smaller mesh sizes...
Strait before the introduction of a 150 mm limit. In a single fishing operation up...
deployed. There are now restrictions on this (see Management). In the early 197...
indicator lights to attach to gillnet buoys, increased the effective effort by allowin...
are taken mainly on the continental shelf from shore to about 80m depth, but som...
tal slope to 350m. School sharks are mainly taken near the bottom, from the sho...

nson's dogfish have recently begun to be exploited for liver oil, by fishers using demersal gillnets
tal slope. Bycatch includes small amounts of silver trevally, boarfish, nannygai, silver warehou,
d John Dory. Port Jackson sharks and swell sharks are discarded live.

hark Fishery began in the 1800s with the capture of school sharks in Victorian inshore waters. In
there was an increase in demand for fresh fillets, and fishers moved offshore and catch increased.
inued to expand, until during the mid 1940's there were complaints of declining catches. About
ere was a collapse of the liver oil market and the fishery did not expand significantly for a about
3). Catches then peaked in 1969 but rapidly fell again during the early 1970s. This was partly
over the mercury content of large school sharks. During the following phase of expansion there
n the proportion of effort in SA (Figure 4b). Due to government controls, effort was reduced by
1987 to 1994 (Figure 4a). During the same period there was a decline in the catch of school
steady catches of other species (Figure 5).

he catch has been taken in Victorian waters. However there has been an increase in the
l catch taken in SA, primarily due to an increase in the catch of gummy shark in that state. In
272 t carcass weight was taken with an estimated value of A$15.6 million (US$12 200 000).

rently state proclaimed waters in Vic., Tas., and SA are managed by the respective state
and Commonwealth waters are managed by AFMA. The state fisheries agencies and AFMA
to make management regulations that complement those in the other jurisdictional areas. An
tional Settlement has been made such that as from 1 July 1996 the fishery will be managed
alth law, by a Joint Authority comprising the three States and the Commonwealth.

: In 1984 the Commonwealth began issuing Commonwealth Fishing Boat Licences with 'shark
ts'. There are currently 126 gillnet boats and 33 hook boats with Commonwealth Fishing
hese vessels also have at least one licence to operate in a State's proclaimed waters. After 1
rs with Commonwealth Fishing Permits allowing them to use demersal long lining gear, need-
riteria in order to continue catching gummy and school sharks. Those who were unsuccessful
the method but are limited to a trip bycatch of five carcasses of these species combined.

Devices used in the longline sector to increase efficiency, such as baiting and snood removal
ed. In Commonwealth waters, there is also a 2000 hook limit during a single fishing duration.
k Hook Permits were introduced, fishers were endorsed for either 1000 or 2000 hooks,
catch history.

num mesh size of 150 mm has been effective since 1975. In 1988, in an attempt to reduce
restrictions were placed on the number, size and construction of nets. A system based on net
here a net unit was defined as a monofilament gillnet 20 meshes deep with a headrope 600m
the net could be increased as long as the overall area remained the same. Net units were
d on their catch history and number of gillnets used during a five year qualifying period.
units were issued to 241 fishers. A total of 1234 net units were endorsed with an annual
n. Due to this fee and the non-transferability of units there was a decrease in their number.

Size limits: A minimum legal length limit was introduced in the early 1950s. Fr
legal length for school sharks marketed in Victoria was introduced, following cond
large individuals.

Temporal Closures: Seasonal closures are used primarily to reduce the mortality
migrating to nursery areas at the end of the year. From 1953 to 1963 there were c
November. A landing limit of five carcasses was imposed during November, 1993
SA/Vic. border and during December, 1993 to the rest of the fishery. The use of g
and gummy sharks were prohibited in the area to the west of the border from 8 O
and in the rest of the fishery from 11 November to 25 December.

Spatial Closures: Since 1954 selected inshore areas around Tasmania have been
are prohibited in Western Port Bay and Corner Inlet, Victoria.

Status

Current estimates of sustainable catch are 1875 t of gummy shark and 825 t of sch
pers. comm. 1995). These levels are close to the 1994 catches of 1814 t and 959
only very recently that catch levels have been so low and close to sustainable leve

Gummy shark stock assessments are made in three separate zones, Bass Strait, Sou
assessment made in 1994 for Bass Strait suggested that the population biomass wa
existing prior to fishing. As a 'rule of thumb' such a level is generally considered
recruitment to the fishery has been relatively stable for the last 20 years also sugge
are sustainable. Less detailed assessments are available for the other zones althoug
the South Australian zone population biomass is between 40 and 50% of unfished

There are far greater concerns over the sustainability of the school shark compone
mal assessment was made in 1991 when it was suggested that the population had l
10 and 15% of its original biomass. At that time, an annual catch of 550 t was re
1000 t for the next three years. A recent assesement by the Southern Shark Fishe
the stock to be depleted to between 13 and 45% of pre-exploitationmature bioma
current effort level is unsustainable and a reduction in effort of 42% is required to
of not being below the 1996 mature biomass at the start of 2011 with a probabilit
1996). It has been suggested that a reduction of the mesh size of gillnets to 6 inch
catch levels by shifting effort towards gummy sharks. However there have been c
such a change would increase wastage due the drop out of larger sharks during hau

3.2.1.1.2 WA South Coast Shark Fishery

The information for this section was drawn from Simpfendorfer (pers. comm. 199
(1995), Lenanton et al.. (1989) and Kailola et al.. (1993).

The shark fishery on the south coast of WA is officially known as the Southern D
Longline Fishery (SDGDLF). It has been divided into two separate management
arately below.

..8 km with about 970 hooks baited with fish, squid or octopus. Handlines are usually fished on which are unsuitable for the other two methods.

sition

n changes in the catch composition in both zones. In Zone 1 there has been an increase in the isky whalers and a decrease for whiskery and gummy sharks (Figure 7 a). In comparison there has e in the proportion of gummy sharks and a decrease in whiskery sharks in Zone 2 (Figure 8 a). es are dominated by dusky sharks in Zone 1 and by gummy sharks in Zone 2 (Tables 3 and 4). in Zone 1 bycatch totalled 48.4 t, consisting mainly of West Australian jewfish (Glaucosoma en snapper (Nemadactylus valenciennesi) and blue groper (Achoerodus gouldii). In Zone 2 t, consisting mainly of queen snapper and blue groper.

gummy sharks caught are 95 to 125 cm and 90 to 135 cm fork length respectively and are mostly sexually t most dusky sharks caught are 70 to 95 cm fork length and are mostly less than one year old and immature.

ishery for sharks in southwest Western Australia started in 1941 around the Busselton region d significant catches by 1949. There was a considerable increase in effort from 1950 to 1970 but between 1972 and 1976 due to concerns about mercury levels in shark flesh. During the early igned shark boats were built that could fish further offshore. This resulted in a quite rapid t. In Zone 2 effort increased until a peak of 170828 km.hours in 1992/93 (Figure 8 b). A of 40026 km.hours occurred in the following year, the largest drop since 1975/76. Effort in 1986/87 at 121134 km.hours and has continued on a downward trend to 50757 km.hours in b).

lecrease in nominal catch rates in both zones for all species (Figures 7c and 8c). Such decreas- dramatic for whiskery sharks. In Zone 1 catches of the main two species, dusky and whiskery d since the early 1980s (Figure 9). In contrast catches of all species continued to rise in Zone cently (Figure 10)

ged under a Joint Authority between the Commonwealth and the Fisheries Department of The latter is the managing partner. The Joint Authority was set up because this fishery is g the same stocks of gummy and school shark as the Southern Shark Fishery.

In June 1988, entry to the fishery was restricted. Entry was given to fishers with a year fishing history. No licences have been issued since.

t the same time that licence limitation was introduced a system of gear restriction based on mplemented. Time-gear units were allocated based on fishing activity in a three year qualifi- kample, a fisher who had fished for a maximum of 8 months in any year and had used a vould be allocated 40 time-gear units. They could then fish 8 nets for 5 months, 4 nets for for 8 months etc. At present effort is being reduced by reductions in time-gear units and the n 1992 there was a ten percent reduction in standard net length in both zones. In Zone 2 0% reduction in 1994. In th...

Size limits: None

Temporal Closures: There was a 120 nautical mile closure, between 127° E and 1 with the temporal closures in the Southern Shark Fishery.

Spatial Closures: None

Status

Fisheries biologists at the Bernard Bowen Fisheries Research Institute, WA, have r impact of future catch regimes on catch rates. Models of population dynamics hav trends in catch rates and biological processes, including growth rates and informat there are uncertainties in these models, the projections provide the best way of ass regimes. Continued research into biological processes will improve the predictive

A management target of stabilising adult stock at or above 40% of the population been used in these models. For whiskery, gummy and dusky sharks this would mea have to be reduced to 60%, 40% and 50% of the 1993/94 catch of each species. T about the current status of dusky sharks than the other two species. Such reductio near future although the system of time-gear units currently in place provides a go changes.

There are some problems with the collection of data in the fishery. Most fishers d shark fins landed and sold. There may also be fishers not included in his fishery w fins, but who do not record their catches on monthly returns.

3.2.1.1.3 WA West Coast Shark Fishery

The information in this section was drawn from Simpfendorfer (pers. comm. 1995 Simpfendorfer and Lenanton (1995) and Kailola et al.. (1993).

Definition

The West Coast Demersal Gillnet and Demersal Longline Fishery (WCDGDLF) i mercially by demersal gillnet and demersal longlines in the EEZ between 33°S and

Methods

The methods used in the WCDGDLF are similar to those on the south coast shark 3.2.1.1.2).

Catch Composition

There has been an increase in the proportion of 'other' shark species caught, most whalers), and a decrease for whiskery and gummy sharks (Figure 11 a). In 1993/94 37.2 % of the catch (Table 5). In the same year teleost bycatch was 135.8 t, consi WA jewfish and samson fish.

gh they have increased slightly since the late 1980s (Figure 11).

Fisheries Department of Western Australia.

tion: The WCDGDLF remained open access for longer than the fishery on the south coast. ently 39 licences although only about 7 have significant catches of shark.

ns: At present there are no gear restrictions but there are plans to manage the fishery using time- lar to those used in the SDGDLF.

one

ures: None

s: The northern part of the fishery above 26°S and including the waters of Shark Bay are closed hark fishing through gear restrictions (Figure 6).

ishery is thought to exploit the same stocks as the SDGDLF. (There may be a separate stock of n the west coast but this fishery catches relatively very few). Therefore the population dynamics in relation to the SDGDLF apply to this fishery also (see section 4.2.1.1.2.).

North Coast Shark Fishery

this section was drawn from C. Simpfendorfer (pers. comm. 1995) and Simpfendorfer and Lenanton (1995).

rk taken commercially by droplines and demersal longlines in the EEZ between Northwest Cape e 6).

glines only.

ion

a for the WA North Coast Fishery and the western zone of the Northern Shark Fishery are not tion, catch return data are suspected to include mis-identifications. At present, tiger sharks n representing over 40% of the total production (Table 6).

Shark fishery has operated since at least 1975 but catches remained at around 60 t or less until ere was a large increase in catch to over 300 t

Jurisdiction: Fisheries Department of Western Australia

Licence limitation: Yes

Gear restrictions: Dropline and longline only

Size limits: None

Temporal Closures: None

Spatial Closures: None

Status

There has been little research done on this fishery and catch statistics may not be species identification. As such its current status is unknown although catches are area and the large variety of species being exploited. More research is needed int well as a better standardisation of catch data.

3.2.1.1.5 Northern Shark Fishery

The information in this section was drawn from Johnson (1995) and McLoughlin

Definition and Methods

All species of shark taken commercially in the EEZ between 123° E and Cape Yor three zones in the fishery Timor, Arafura and Gulf of Carpentaria (GoC) (Figure aries which depended on the gear type used. Pelagic gillnets: beyond 12 nm from zones and 25 nm in GoC zone. Pelagic longline: from low water mark in Arafura baseline in Timor and GoC zones. Demersal longline: beyond 3 nm from baseline beyond 25 nm from baseline in GoC zone only. The dominant fishing method is Offshore Constitutional Settlement negotiations the GoC and Arafura zones, alo waters, will be managed by Joint Authority between NT and the Commonwealth proclaimed waters will be controlled by Joint Authority between the Commonwe

Catch Composition

The Northern Pelagic Fish Stock Program carried out field work between January pelagic gillnets (465 sets) and pelagic longlines (150 sets). Most of the effort was Wessel Islands, north-west Gulf of Carpentaria and the Arafura Sea off NT. Catc depend upon area, with Australian blacktip sharks accounting for between 24 and Spot-tail sharks represented a greater proportion of the catch in the Gulf of Carpe the Northern Territory than elsewhere. The size distribution of Australian Blackt larger individuals being caught by longline. For the study area as a whole the cat dominated by Australian blacktip and Spot-tail sharks (Table 7). Other catch inc (*Scomberomorus semifasciatus*), spanish mackerel (*S. commerson*), long-tail tuna (T tuna (*Euthynnus affinis*).

There is no data readily available for the commercial fishery which is currently op er spread to WA and Qld. waters. Effort rose quite rapidly in the early 1980s, reaching a peak of in Northern Territory (NT) waters in 1987 (Figure 15). Between 1986 and 1990 catches in NT ealth waters were similar at around 450 t. In 1992, AFMA introduced a management plan for the monwealth waters. Since then there has been a steady decline in both effort and catch (Figure atch rates in NT waters have been relatively steady.

ee Definition.

ion: In 1994 there were 39 licences in the area now under NT/Commonwealth jurisdiction. al of 13 licensees in the WA North Coast Fishery and the WA/Commonwealth area of the NSF. ensees hold entitlements for more than one zone. A three-for-one licence reduction scheme is negotiated with industry.

ns: There is an Australia wide 2.5 km length limit for gillnets. Mesh size must be between 150 he maximum allowable length for longlines is 39 km. There is a self imposed industry maximum 25m for new vessels.

ne

res: None

s: None

s of Spot-tail and Australian Blacktip sharks are considered to be underexploited. The Northern ck Program estimated that, in waters adjacent to the NT, the maximum sustainable yield for these d is 3400 t annually. The catch has been well below this value since the inception of the fishery. s concern that the same stocks of these species are being exploited in Indonesian sectors of the or seas. There may need to be greater consideration of such activities in managing the of these sharks.

eensland East Coast Shark Netting

in this section was drawn from M. Lightowler (in litt. 1995) and G. Macpherson (pers. comm. 1996).

rk taken commercially in state proclaimed waters between the Qld./NSW border and Cape y is not specifically managed for sharks although many of the holders of an East Coast Net get them.

formation is the result of a questionnaire sent in May 1994 to fishers with an East Coast Net

Do not take shark	75

Gear used to take sharks	Number of respondents
Nets	81
Gillnets	63
Offshore gillnets	18
Foreshore set gillnets	8
Tunnel nets	14
Mesh nets	23
Ring nets	9
Drift nets	21
Line	114
Alvey reef winches	2
Trawl	41

Catch Composition

Details on the catch composition in this fishery is unavailable. However it is rep mainly of the genera Carcharinus, Rhizoprionodon and Hemipristis.

Catch History

Sharks have been caught in southern Queensland for at least the last century. Ho catches have become significant. This is primarily due to an increase in demand reductions in catch from the Southern Shark Fishery. At present no catch data i only. The following data includes bycatch from prawn trawlers and represents th of Queensland. Catches remained fairly stable from 1988 to 1991, but have risen probably the result of an increase in the number of boats that took shark (Figure

Management

Jurisdiction: This fishery is entirely under the jurisdiction of the Queensland Fisheries

Licence limitation: There are 1027 East Coast Net Endorsements but some vessel

Gear restrictions: Various restrictions apply to each type of net.

Size limits: None

Temporal and Spatial Closures: Exist for some types of gear in certain areas.

Status

There has been very little research into this fishery and as such its status is unkn quite rapidly in the last two decades and could potentially reach unsustainable le detailed catch information, specifically catch composition. Without such inform asses the sustainability of current catch levels.

Coffs Harbour and Jervis Bay although they are concentrated on the Central Coast (D. Pollard, 996). The fishery has come under criticism because of a bycatch of the protected Grey Nurse Shark). The use of longlines is banned around Fish Rock (near South West Rocks) and may also be pro- eal Rocks. Underwater SCUBA surveys done by NSW fisheries suggest that there has been a abundance of both wobbegongs and grey nurse sharks in the vicinity of Seal Rocks (D. Pollard, 996). There is no information on the catch from this fishery only, although the total state catch of 1993 was 117 t.

NSW Ocean Tap and Line fishery also target school and gummy sharks south of Moruya. This is tension of the Southern Shark Fishery but is not formally included in the fishery. The magnitude unknown (C. Allen, pers. comm. 1996).

l target fishery for endeavour dogfish which operates in the canyons off Jervis Bay, NSW. e is only one operator using bottom set droplines. The fishery is highly seasonal and in some years (K. Rowling, pers. comm. 1996).

/, some trawlers in the Southeast Fishery occasionally target deep sea dogfish for their squalene Bradley, pers. comm. 1995). A similar fishery is reported to occur off South Australia (T. Walker, 95).

tch

na Fisheries

n in this section was drawn from Ward et al.. (1994), Caton et al. (1994) and AFMA, in litt. (1995).

na fishing activities in the Australian Exclusive Economic Zone (EEZ). This includes the East n Bluefin and Western Tuna Fisheries. Most of the catch is taken by Japanese longliners but in y domestic shark bycatch is described.

oling, trolling and pelagic longlining are used to catch skipjack (*Katsuwonus pelamis*), yellowfin *res*) and southern bluefin tuna (*T. maccoyii*). Sharks are primarily caught in long lining operations.

sition and Catch History

an Australian fishery for yellowfin and skipjack tunas off NSW since 1954. In the mid 1980s ed tuna were successfully air-freighted to Japan the fishery began to expand rapidly. However as a e catch rates, high freight charges and unpredictable markets the fishery later contracted. Most of ort occurs off the NSW coast.

n tuna was first targeted by domestic poling vessels in the early 1950s off NSW and South fishery later spread to WA but after catches peaked in the early 1980s they rapidly decreased. c operations use longlining and trolling methods off Tasmania and southern NSW.

sheries on the east coast show that mako sharks are the most common chondrichthyan bycatch

Sydney some fishers have been reported to target sharks when no tuna are present

Management

All the major tuna fisheries are managed by the Australian Fisheries Managemen NSW state waters, where an Offshore Constitutional Settlement is yet to be final there is a Total Allowable Catch (TAC) implemented through a system of Indivi system was introduced in 1983/84 and in 1993 the TAC for Australia was 5265 t East Coast Tuna Fishery has limited entry and there are restrictions on gear and v

Status

The Southern Bluefin Tuna Fishery is considered to be over-exploited and there i the domestic component in the near future. The status of the East Coast Tuna Fi to be overexploited. The government is encouraging domestic operations to expa Japanese effort which is currently six times as high. Therefore while the domestic than the foreign component, it may increase in the future.

3.2.1.2.2 South East Fishery

The information in this section was drawn from Staples and Tilzey (1994), G. Lig J. Garvey (pers. comm. 1995).

Definition

All species caught in the area from a line east from Barrenjoey Point, NSW to a and between three nautical miles offshore to the limit of the EEZ except where th agreement (Figure 18).

Methods

The fishery includes a wide variety of gillnet, hook and trap fisheries but is domin ponent. Examples of sub fisheries are the deepwater blue grenadier (*Macruronus* roughy (*Hoplostethus atlanticus*) fisheries off Tasmania and Danish seine operation Victoria.

Catch Composition and Catch History

The South East Fishery (SEF) started in the early 1900s exploiting continental sh 200m. The fishery was dominated by steam trawlers from 1915 to 1950 and by D Since then modern demersal trawlers have allowed the fishery to expand to deep the mid 1980s most effort has been concentrated in the depth ranges 50 to 100m 500 m.

Until the mid-1980s most of the catch was taken from NSW and eastern Bass St commercial quantities of orange roughy off Tasmania caused a southward shift in effort in the fishery has remained relatively stable at around 75000 trawl hours.

...P observers based at the NSW Fisheries Research Institute monitor catches of boats in Eden and Ulladulla.

...data presented here is of total catches which includes both retained and discarded catch. Under-... potentially occur and indeed is suggested by comparing these data with catch disposal records. The ... records are up to twice the amount recorded by logbooks (Figure 19). Dogfish, angel, school and ... dominate the catches of commercially landed chondrichthyans (Figure 19). There is also a large ...r sharks' and saw sharks. The latter category includes the common and southern saw sharks. ... to potential problems with the integrity of the logbook data, trends in these catches need to be ...refully. Due to discarding, disposal records are also not indicative of total fishing mortality. When ... discarded it is unlikely that many survive due to the great depths at which most trawling is conducted.

... by the BRS Scientific Monitoring Program suggests that a high percentage of chondrichthyan ...ded in all areas of the SEF (Figure 20). However, over the three years of the study, observers ...crease in the percentage retained (Figure 20). The majority of the chondrichthyan bycatch is ...astern zone. This is composed of a wide range of species. For instance in 1994, observers recorded ...pecies of sharks, rays, and chimearas in this zone. Of the ten most commonly caught species in ... has been a decline in the estimated catch of eight (Figure 21). Only the brier shark, a species ...t entirely retained, had an increase in catch, suggesting that it may be increasingly targetted for ...uld be noted that the estimated catches presented in Figures 20 and 21 are based soley upon total ...es and the percentage of shots monitored in each zone, each year. Only 1.1 to 3.7% of the shots in ... monitored each year. Monitored catches are not necessarily representative of all shots and as ...polations do not take into account seasonal and small scale spatial variation. Furthermore, only ...commercial' species were recorded in every shot. For all other species (all those in Figure 21 ...gfish and brier shark) the weight caught was only recorded in shots where they represented a ...e catch. Therefore, the total chondrichthyan and 'non-commercial' species catches presented ...derestimates.

...y staff at the NSW Fisheries Research Institute has been weighted to take into account variations ... temporal distribution of monitored catches. However they only apply to the catch taken by ...out of Ulladulla and Eden and do not include other ports in the SEF. Chondrichthyan species ... catch rates include piked dogfish, brier shark, angel sharks, saw sharks, southern dogfish and fid-... are relatively high amounts of spatial variation in catch rates and proportions discarded. For ...n there is an average catch rate of piked dogfish of over 100 kg per fishing day of which most is ...lladulla catch rates are lower but almost all of the catch is retained. Catches of sharks and rays ...vely small proportion of the total catch. Extrapolated catches from these data suggest that piked ...nost commonly caught 'commercial' species (Table 8).

...e SEF is wholly under the jurisdiction of AFMA.

...n: In 1985, entry into the fishery was restricted.

... In 1986, a boat replacement policy was introduced to prevent the expansion of effort through

...warehou (*Seriolella punctata*) and redfish (*Centroberyx affinis*). TACs are set each year...

Status

The SEF takes more catch than any other Australian fishery and supplies most of... Melbourne. Its is generally regarded as being overexploited although there is litt... many of the species involved. There are also complications in management beca... are also caught in State waters and/or by recreational fishers. Despite such proble... to drop significantly in the near future.

Further reductions in TACs have the potential to divert effort towards non-quota... chondrichthyans represent a large proportion. Declines in the abundance of tele... value of shark products may cause a shift towards targeting deepwater chondricht...

3.2.1.2.3 Northern Prawn Fishery

The information in this section was drawn from Somers and McLoughlin (1994)...

Definition

The Northern Prawn Fishery (NPF) is a multispecies fishery extending from Cap... York, Qld. At least nine species of prawns, two species of bugs (*Thenus spp*), one... *pleuronectes*) and several species of squid are taken commercially. There are two ... the fishery, one which targets tiger prawns (*Penaeus semisulcatus and P. esculentus*)... prawns (*P. merguiensis*).

Methods

The banana prawn season lasts for a few weeks between March and May. High o... day to target dense 'schools' of prawns. The tiger prawn season lasts for most of t... catches peak in August and September. In contrast, this fishery uses low opening...

Catch Composition and Catch History

The bycatch of the tiger prawn fishery off the Northern Territory was studied in 1... Sharks and rays were the second most important bycatch component, representin... ing on the area. An estimated total of 2612 t of sharks and rays were caught in t... dominated by sharkfin guitarfishes (Family Rhynchobatidae; mostly white spot sh... djiddensis but also shark rays, Rhina ancylostoma) (Table 9). Estimates of bycatc... unavailable. However the study area includes about half the area and about 64%... Nonetheless, xtrapolations cannot be easily made because bycatch ratios and the... ent in areas of the fishery not studied.

Management

Jurisdiction: The NPF is wholly under the jurisdiction of AFMA.

osures: Yes

ontrols: There are trip limits of 100 trunks or equivalent of all species of elasmobranches and 100 sets ns.

s considered to be fully exploited and over the last decade there have been significant reductions in the vessels operating in the fishery. Effort is unlikely to expand significantly in the near future. However, ch may become an increasingly important component of prawn trawler income if fin prices continue

of prawn trawling on chondrichthyan populations may be mixed. There is an increasing trend ining sharks however large rays and sharks are often discarded immediately after capture to prevent he catch. As such their mortality rates may be quite low. Furthermore the discard of other species, teleosts, is potentially increasing the food supply of some shark species thus benefiting their (Hill and Wassenberg 1990).

Other

vide range of trawl fisheries in Australia all of which catch chondrichthyans in varying amounts. information available on bycatch for many of these fisheries. The Great Australian Bight Trawl s demersal fish in a large area from near Kangaroo Island in SA to Cape Leeuwin in WA. Fishing e occurred on the continental shelf in the area since 1912. However the catch has really only been ce the discovery in the mid 1980s of orange roughy stocks in deeper slope waters. Angel shark is a in the inshore component of the fishery (Table 10). There have also been smaller catches of dog- otted spurdogs, wobbegongs, gummy, school, and saw sharks.

Fish Trawl Fishery currently only has one operator. There is probably some shark bycatch from rawling but is unlikely to be significant. There are plans to develop this fishery into a demersal apping fishery. The NSW Ocean Trawl Fishery catches many of the species in the South East ets teleosts within 3 nm in the south of the state and further out north of Sydney. Results from the Research Institute observer study suggest that off Newcastle and Tuncurry catch rates of fiddler ovelnose rays and eagle rays (*Myliobatis spp*) are higher than in southern NSW ports in the SEF. timated annual total catches for chondrichthyans are relatively small compared to the major NSW th East Fishery (Table 8). However, note that this includes catches of two potentially threatened l tiger shark and the white shark. The WA South West Trawl Fishery also targets teleosts, but ks. (C. Simpfendorfer, pers. comm. 1995).

eries in northern Western Australia, Torres Strait, and on the East Coast also have elasmobranch arly ray species. In Torres Strait sharks and rays were found to represent between 1.3 and 2.5 % al catch (Harris and Poiner 1990). There is work being done on bycatch reduction devices by lth Scientific and Industrial Reasearch Organisation (CSIRO), the Australian Maritime College ies Research Institute. These devices generally work well at excluding large animals such as om the catch.

3.2.2.1.1 Taiwanese Gillnetting

The information for this section was drawn from Stevens and Davenport (1991), et al. (1994) and Kailola et al. (1993).

Definition

All species of shark taken by Taiwanese gillnetting vessels in the Timor and Arafura S

Methods

The Taiwanese vessels used gillnets made from multifilament nylon. Just before o or subsurface, depending upon buoy configuration. The nets were then allowed t night. Hauling could take up to 16 h depending on the magnitude of the catch. increased from 7.5 km in 1979, to 15.8 km in 1986. Their depth increased from This lead to an increase in the surface area of the nets and thus to an increase in

Catch Composition

The catches of the Taiwanese gilllnetting vessels was dominated by Australian bl Together these species represented more than 65% of the catch (Table 11). Tuna significantly to catches.

Catch History

The Taiwanese began fishing in the waters off northern Australian in the early 19 nautical miles of the coast from the North West Shelf to Cape York, although eff Wessel Islands (Figure 22). Fishing also occurred in waters off Indonesia and duri catches were about 17000 t. In 1979 the Australian Fishing Zone (now the EEZ) 7000 t processed weight (about 10000 t live weight) was set. The number of vess ing prohibited within 12 nautical miles of the coast and in certain other areas (Fi

There were substantial increases in effort during the early 1980s (Figure 23 a). H proportionally and catch per unit effort (CPUE) continued on its downward tren there was a reduction in effort did increases in catch rates occur (Figure 23 a & b the average length of the main species being caught. In 1985, the quota was redu Because of concerns of overexploitation and the high incidental catch of dolphin ment limited the length of gillnets in northern Australia to 2.5 km, in July 1986. operations uneconomic and they ceased later that year. Some vessels continued t using demersal longlines. Data is available from logbooks and observer boardings The catch composition was similar although the total catch was lower.

There are reports that the Taiwanese gillnetters began to fish in Indonesian water left the AFZ. McLoghlin et al. (1994) reported that 55 were licensed to fish in In dence that the same stocks of some shark species exist in Australian and Indonesi these vessels should be considered in stock assessments for the Northern Shark Fi on for this section was drawn from Stevens (1993), Stevens (1992), Caton et al. (1994), Kailola et al. (1993).

shark taken in the EEZ as bycatch by foreign tuna fishing vessels.

nes of up to 80 km long.

sition and Catch History

longliners have been fishing in waters off Australia since the 1950s. Apart from their catch of
in (*Thunnus maccoyii*), yellofin (*T.albacores*) and bigeye (*T.obesus*) tunas they also catch sharks.
ble data on catch composition comes from the observer program run by AFMA. By extrapolating
records, Stevens (1992) estimated that 34000 blue sharks and 1594 mako sharks are landed each
a off Tasmania by Japanese tuna longliners. He estimated that these numbers corresponded to
live weight of each species respectively. These values may be underestimates. Observers usually
st half of the haul and identify, measure and sex all sharks landed. Biases may exist in this data
half of the line hauled has the lowest soak time. Results from observer trips in late 1993 and 1994
ssels off the East Coast, Tasmania and the Great Australian Bight (GAB) and West Coast indicate
iety of species are caught. Blue sharks (blue whaler) dominate the bycatch off the east coast and
he GAB and West Coast regions crocodile sharks (*Pseudocarcharinus kamoharai*) are more common

ration of the AFZ in 1979, foreign tuna long lining vessels have had to submit logbooks which
d effort. Mis-identification and under-reporting may occur in these data. However they suggest
tities of blue and mako sharks are caught (Figure 24). There are also increasing numbers of
ronze whalers being caught and retained.

agreements between Australia, Japan and New Zealand there is a Total Allowable Catch of the
cies, southern bluefin tuna. A 1994 Subsidiary Agreement between Japan and Australia specifies
re to be either released alive and undamaged, or retained whole. Sharks that are retained must be
y are processed and where fins are retained, trunks must also be retained on board until the vessel
n waters.

t the quotas in place control the amount of effort from foreign longliners. However the bycatch
significant. Although many of these are released it is unclear what their survival rate is. Most
bly alive when the longlines are retrieved but may be damaged during removal.

onal

eastern Australia between Port Stephens (33°S) and Bermagui (37°S) (Pepperell
a change in catch composition and the size of species between 1961 to 1990. A
Whaler sharks dominated the catch during the 1960s but declined drastically in
following decades. There were concurrent increases in the catch proportions of
percentage of white sharks decreased from 4.5% in the 1970s to 0.2% in the 198
average size of both mako and blue sharks (Pepperell 1992).

As with much catch data these results must be interpreted carefully since they co
behaviour of fishers. Pepperell (1992) suggests that the changes in catch compos
fishing further offshore. Changes in sizes of sharks landed may be a consequence
activities, in which only larger individuals are kept, and the self-imposed minimu
Association in 1983 (45 kg limit) and 1987 (60 kg limit). No effort data is availa
changes in abundance of sharks from this data.

In a study of offshore trailer boat anglers staff at the NSW Fisheries Research Ins
Kingscliff, Evans Head, Coffs Harbour, Crowdy Head, Long Reef, Botany Bay, Br
Bellambi, Ulladulla, Bermagui and Eden. At each ramp 48 days were monitored
per season) but not necessarily all catches recorded. Extrapolations have not bee
resented a small proportion of the retained catch (Table 13). A relatively high p
be discarded, and are therefore not present in these data. Most rays are probably
targeting jewfish. These are often killed but not retained for consumption. Angl
NSW often catch blind sharks, whaler sharks and wobbegongs (A. Steffe and G.

Although data is unavailable, the recreational catch of sharks in WA is probably
returns from sharks came from recreational fishers (C. Simpfendorfer, pers. comm
catch limit of four individuals of each species of shark per day.

Williams and Schaap (1992) studied the catch of recreational gillnet fishers in sh
Tasmania. These shallow bays and estuaries were proclaimed as nursery areas in t
discovered that they provided important habitats for juvenile and newborn schoo
both school and gummy sharks is prohibited, Williams and Schaap (1992) found
areas recreational gillnetting could contribute significantly to the fishing mortalit
bays they estimated that 133 135 school sharks could potentially be taken, equiva
ber of adults landed by the Australian commercial fishery in 1989. Gummy shark
dogfish, southern sawshark and elephant fish were also taken in relatively high n
species were generally higher in deeper water. Since this study there has been a b
nursery areas in depths greater than 10 m.

3.4. Beach Meshing

3.4.1. New South Wales

The information form this section was drawn from Reid and Krogh (1992), Krogh
1993, D. Reid, pers. comm. (1995) and M. Krogh, pers. comm. (1995).

Definition

All species of sharks and rays taken by the Protective Beach Meshing Program of position

ds and whaler sharks (Family Carcharinidae) represent over 65% of the total catch although a wide
ecies are caught (Table 14). Rays (including species from the families Rajidae, Dasyatididae,
Mobulidae, Myliobatidae, Rhinobatidae, Rhinopteridae and Rhynchobatidae) are the most
atch' species. Between 1950 and 1993 at least 2074 rays were taken. Over the period 1989 to 1993
approximately 80 rays were caught per year. These are probably underestimates due to
particularly in earlier years.

all amounts of other bycatch are taken in the NSW beach meshing operations. Very small numbers
species including school, porbeagle and blue sharks.have been caught.

1993 other bycatch included 94 'dolphins and porpoises', 5 dugongs, 282 jewfish (*Agyrosomus*
53 tunas, 22 kingfish (*Seriola lalandi)*, other teleosts, 56 turtles (mostly *Chelonia mydas*) and one

y

ch meshing for sharks started in 1937. Apart from a break of 3 years during World War II, it has
ost continuously under government contract since 1939. The more stringent controls, and the
f sites on the Central Coast in 1987, has increased nominal effort. However reductions have also
o the exclusion of June and July since 1983, and May and August since 1989. Despite these small
e amount of effort has been relatively stable (Figure 25).

a requirement for operators to return monthly statistical returns which detail the number of nets
shark, its taxonomic classification, length, sex, number of unborn young and whether it was alive
he net was cleared. Data on bycatch is also recorded. Records are only complete since 1950,
and 1992

e been analysed in a number of published papers which examine temporal and spatial patterns in
rks and bycatch (Reid and Krogh 1992; Krogh 1994; Krogh and Reid in press). There has been a
catch and catch per unit effort of most species (Figures 26 & 27). Grey nurse and white sharks
e quite pronounced rates of reductions in catch. However other species such as hammerheads
show no sign of reduction in catch.

SW Fisheries.

n: There are a number of operators contracted to mesh certain areas.

: Nets are standardised to 150m long, 6m deep and with a mesh size of 50-60 cm. They must
nthetic filament with a specified hanging ratio, lead-line and float-line details.

e

es: No nets are set from May to August.

Nets are set at the following beaches only. Newcastle area: Stockton, Nobby's, Newcastle
wether, Redhead, Swansea, Caves, Cath...

Output controls: All sharks must be dumped at sea. This is to prevent a potent
could arise if operators were trying to catch more sharks, possibly through attracti

3.4.2. Queensland

The information in this section was taken from Patterson (1990) and QDPI (199

Definition
All species of sharks and rays taken by the Queensland Shark Control Program.

Methods
Baited demersal drumlines are used in addition to gillnets and in some areas pred
200m long and 6.2m deep and of 50 cm mesh. They are fixed on the sea bed by
Drumlines consist of a single number 14 Mustad hook and marker buoy connecte
when sea conditions do not allow the setting of nets or when nets are likely to ta
These devices are checked at least every second day. At least three times in each
be accompanied by an officer of the Boating and Fisheries Patrol.

Catch Composition
Half of the shark catch in the Queensalnd Beach Meshing Program are tiger or h
The remainder are mostly whaler sharks (Family Carcharinidae). There is also a s
fish and shovelnose rays caught in the program (Table 16).

Catch History
The protective beach meshing program in Queensland has been operating since 1
sures had been introduced to Cairns, Townsville, Mackay, the Sunshine Coast an
Rockhampton, Point Lookout, Bundaberg, Rainbow Beach and Tannum Sands w
1973, 1974 and 1983 respectively. In all areas there has been a reduction in the
However this trend is difficult to interpret without data on effort. For example, t
sharks at the Gold Coast may be a result of a shift in effort towards longlines whi
Simpfendorfer (1992) found that drumlines off Townsville caught larger tiger shar
been declining trends in the catch of most species (Figure 29). In particular, ham
during the 1960s but have decreased in relative importance, being replaced by tig
this is probably a result of the increase in use of drumlines. Patterson (1990) repo
of tiger shark catches and less than 2% of hammerhead catches.

Shark control measures as employed in Queensland, NSW and South Africa are
of attacks on humans by reducing the shark populations. There is evidence that
these goals. For instance in Queensland between 1919 and 1961 there were 26 fa
between 1962 and 1986 (Patterson 1990). The shark control programs themselve
most species suggesting decreased abundances.

It is unlikely that shark control programs will be terminated in the near future. A o be considered. (See Stevens and Paxton, 1992; Patterson, 1979; Patterson, 1990 and Krogh and for further discussions of conservation issues involved in these programs).

ethal Exploitation

ational Diving

umber of locations which are well known for recreational diving with sharks.

Rocks, NSW

colony of grey nurse sharks lives near Seal Rocks and it has been a popular place for divers to visit years. During the 1960s and 70s, populations of these sharks were severely reduced by recreational n. Since 1984 they have been a protected species, under NSW Fisheries legislation.

Lincoln, SA

angerous Reef and the Neptune Islands off Port Lincoln, SA are world renown for their relatively y of white shark sightings. Recreational cage viewing has been conducted there since the 1960s. racted to the vessel using a chum containing ingredients such as fish oil, blood, meat and offal. d at regular intervals for periods of up to 10 days or more until a shark arrives. There are concerns ice may conflict with other users and potentially cause viral and/or bacterial contamination in the er is of concern particularly because of the presence of a number of seal colonies in the area. use of blood, bone, meat offal or skin of an animal is prohibited within three kilometres of the nds or reefs which are exposed at low water. This includes the activities of game fishers. A recent er produced by Primary Industries SA - Fisheries has suggests that this be amended to include all scale chumming within two nautical miles of 'dry land'. Consideration may be given for special areas where the risk of conflict with other users and seal colonies is minimal. A limited entry me for the cage viewing industry is also suggested. Such licenses would carry conditions such as synchronised with seal pupping times at various colonies, the refrigeration of fish oil to reduce the he use of ropes and floats which are not harmful to the sharks, public notification and flying of a berley pennant.

t Barrier Reef, Qld.

common for live-aboard dive boats on the Great Barrier Reef to include a shark feeding dive as part of One such operation occurs at Flinders Reef, where divers remain in a bottom anchored cage watch- acktip, whitetip, silvertip and grey reef sharks in a feeding frenzy on moored bait (Saunders 1995)

aloo Reef, WA

of whale sharks occur off Ningaloo Reef from March to May. It is believed that they congregate at ke advantage of the additional food arising from the concurrent spawning of corals. In 1995 th

Department of Conservation and Land Management, WA. These include licens Conduct to be adhered to (Stevens 1993). Whale sharks are now protected in W

4.2. Aquarium Collection

Epaulette sharks (*Hemiscyllium ocellatum*) occur in shallow water on coral reefs in New Guinea. They grow to only about 1 m in length and survive well in aquaria are taken for the aquarium trade but the magnitude of catch is unknown, althoug

Grey nurse sharks and other similar sharks are captured for use in oceanariums. T Australia each year is probably very small.

5. Summary of Exploitation

To asses the relative importance of various forms of exploitation on shark populat summarise the information presented in the previous section to the species level. sented in Table 1, the size of the catch is indicated for each fishery discussed. Cat presented in Tables and Figures in Section 5 for some fisheries. Where such data catch have been made based upon total landings of sharks or rays for the relevant the catch of similar fisheries. They are the authors own estimates and should not accurate. The view has been taken that in instances where no information is ava better than none at all. They are necessary in trying to determine the relative im exploitation. Where the distribution and habitat of a species suggests that it may but there is no information on the size of catch the lowest category has been assig

Table 17 is designed to be used to determine which fisheries take the greatest catc assessment is provided of the sustainability of catch levels. If a certain species is c cern, then Table 17 aids in the identification of the relevant priority fisheries. It some instances different fisheries are exploiting different populations of the same endemic to Australia, or are unlikely to be exploited to a large degree overseas are be summarised from Table 17:

- The greatest catches of squalids occurs in the demersal trawl fisheries, particula Squalids are also taken as bycatch in some of the target shark fisheries.
- The majority of the catch of sawsharks and wobbegongs is taken by target shar these species are taken in the Southern Shark and NSW Ocean Trap and Line Northern Prawn Fishery probably has the greatest catch of northern species of
- The South East Fishery probably takes the greatest quantity of Port Jackson sha catches in other fisheries may be equally important.
- The greatest catches of grey nurse sharks occurs in the Western Australian shar commercial netting in Queensland may catch significant quantities.
- Thresher sharks are caught by both domestic trawlers and foreign tuna longlini
- It is unclear whether the greatest catches of white sharks occurs in demersal tra

ignificant quantities of these species are also caught in demersal trawl and other fisheries.

fossil sharks are probably caught in greatest quantities in the Northern Prawn Fishery.

andbar sharks are almost exclusively caught in Western Australian target shark fisheries.

illnetting operations off northern Australia took the greatest quantities of spot-tail and Australian
arks. Since the cessation of these activities, the Northern Shark Fishery dominates catches of these
e Northern Prawn Fishery could also take significant quantities of these species.

y of the tiger shark catch is taken in the Western Australian North Coast and Queensland East
Netting Fisheries. However, a relatively large bycatch is probably taken in the Northern Prawn

are caught in the greatest quantities by foreign tuna longlining vessels.

d sharks are caught as bycatch in a wide variety of activities including target shark, southern and
nersal trawl, tuna longlining fisheries and beach meshing operations.

are taken in greatest quantities by the South East Fishery and the Great Australian Bight Trawl

nd fiddler rays are mostly taken by the New South Wales Ocean Fish Trawl Fishery and the South

n Prawn Fishery dominates catches of shark rays, white-spotted guitarfish and green sawfish.

nd skates are almost exclusively caught in demersal trawl fisheries.

and chimaeras are mainly caught in demersal trawl fisheries although the former is also taken as a
e Southern Shark Fishery.

tions of landings

ks have been primarily caught for their flesh. In Australia this is often sold as fillets, and known
in 'fish and chip'. The Melbourne fish market in particular sells a lot of shark from the Southern
hark Fisheries.

ch are rich in oil have also been used. During World War II there was a large demand for
the Southern Shark Fishery. However this market collapsed when synthetic imitations became
e is still some demand for squalene oil which is used in cosmetics and as a high-grade machine oil
ns 1994).

of increasing diversification in the use of sharks. For instance, in the Northern Prawn Fishery
ght as bycatch may be trunked, filleted or skinned. First dorsal fins, greater than 10 cm across the
ns and lower caudal fins are occasionally retained from hammerhead sharks, sawfish and sharkfin
e stomach bags of larger sharks may also be retained (Pender et al. 1992).

suggest that a wide range of products are starting to be produced (see section 7.2.2). In Victoria
alia in particular there appears to be an expansion of shark processing activities. These include
one cartilage for the extraction of potentially anti-cancer substances, removal of squalene from

7. International Trade

7.2.1. Import

Data on the import of shark products into Australia are available from the Austral
Food and Agriculture Organisation of the United Nations (FAO) Fishery Statistic
the New Zealand Fishing Industry Board (NZFIB) database. The ABS statistics ar
and are available from January 1988 to present for the categories: dogfish and othe
fish and other sharks, frozen; and dried shark fins. Between 1988 and 1994 Austra
of fresh or chilled, 21.2 t of frozen and 8.5 t of fins at average prices of US$ 2.89,
(Where prices are given as an average over the whole period 1988 to 1994, an ave
A$1=US$0.76 is applicable).

Most of the frozen imports went to Victoria but there were also sporadic shipment
18). Forty five percent of frozen imports came from New Zealand, which also had
(Figure 31). These New Zealand imports have increased quite rapidly, although th
notably in 1991 (Figure 32). There are large discrepancies between the data from
New Zealand statistics record far greater quantities of shark products being exporte
tics record as being imported from there (Table 19). At present there is no explan

Fins are by far the highest value shark product being imported. Between 1988 and
US$ 600,000 per year. There has been a trend of increasing imports of fins (Figure
depressed levels for this product also. The average price per kilo appears to be inv
imports (Figure 33). There is relatively good correspondence between the ABS an

Fins are also the most commonly imported product, with supplies arriving consiste
Most imports are into NSW and Victoria. There are numerous countries of origin
cantly (Figure 31). There are quite different trends in the product coming from th
35). For example, Hong Kong and Japanese exports to Australia arrive mostly in
around US$ 75 to 100 since 1988. In contrast, fins from Singapore are arriving in
price has risen quite dramatically from around US$ 40 to US$ 175 in 1994. Impo
recent but in the last two years have outstripped those from any other country. T
is only around $US 40. The variation in the price of fins from different countries
processing.

Imports of fresh product has been minimal. All product comes from New Zealand
Victoria. The greatest imports occurred in 1991 with a total of 19.98 t at an averag

7.2.2. Export

For exports ABS data includes two categories: dogfish and other sharks, fresh or c
frozen. However for the period 1988 to 1994 only frozen product was recorded.
exported in only small amounts apart from a large shipment in 1991 from Queens
from the Australian Quarantine and Inspection Service (AQIS), records more de
that a large variety of products were exported (Table 21). Fins, mostly in dried fo

usions and Recommendations

yans have become an increasingly important part of Australia's fisheries production. However there eficiencies in the management of some chondrichthyan resources and overexploitation has resulted. rget shark fisheries off southern Australia have all shown signs of overexploitation. In addition, there ibstantial increase in the bycatch of sharks and rays in demersal trawl fisheries.

has aimed to identify Australian chondrichthyan species and fisheries of priority conservation though detailed biological information is lacking for many species the following were identified as f the most susceptible to overexploitation: members of the dogfish family (F. Squalidae), grey nurse *arias taurus)*, white shark *(Carcharodon carcharias)*, school shark *(Galeorhinus galeus)* and several e family Carcharinidae including the dusky *(Carcharinus obscurus)* and sandbar (*C. plumbeus*) sharks. oted that this list is not exhaustive and would probably include many more species, particularly rays more information was available.

cies the school and dusky sharks are caught in the greatest quantities. They are targeted in the stern Australian and Southern shark fisheries. Although there have been concerns over the sustain- se fisheries, the enforcement and research infrastructures presently in place provide a sound basis for gement. However the usefullness of these tools will depend upon the willingness of politicians to ially unpopular decisions.

other Australian target shark fisheries are lacking in their management. In particular there is gener- quate scientific basis on which to base sound management decisions. The Queensland East Coast rth Coast and the Northern shark fisheries are all in northern Australia and target similar species. A and Northern fisheries have management plans in place that deal directly with shark catch this is ueensland. Some research is currently under way in northern WA but even reliable catch statistics ies are unavailable. The same is true in Queensland. Catches in these fisheries are currently . However there is a potential for increased pressure on these resources if southern shark catches decline. In the Queensland fishery in particular there is the potential for a shift in effort towards

ndation 1.

of northern Australian shark fisheries be improved through more research into the catch and the e species involved. The current research in southern chondrichthyan fisheries should be used as a

ndation 2.

nt plan should be developed for the Queensland East Coast shark fishery. This plan should deal ith sharks and include measures that allow for their catch to be restricted despite shifts in effort.

t fisheries such as that for wobbegongs off NSW also require greater management. Where species tly managed there is potential for changes in fisher behaviour to dramatically increase catch.

of chondrichthyans is becoming increasingly large. Furthermore the species of sharks and rays ten demersal deepwater species with restricted distributions and slow growth rates. In particular the ishery catches large quantities of dogfish, draughtboard sharks and rays. Research has been done on of the bycatch and results should be available soon. However there is a severe lack of knowledge

The bycatch of tuna longlining activities in Australian waters should also be con uals probably have a higher chance of survival than in trawl fisheries, quota restri

Beach meshing activities are probably a comparatively minor concern for the con chondrichthyan species. However their effect on grey nurse and white shark pop There is the potential for much useful scientific information to be gained from th could serve as useful indices of species abundances.

Recommendation 4.

Proper scientific research should be done on the catches of shark meshing progra information they contain.

In some countries, restrictions on trade are the most effective method for control resource. However in Australia there is already a relatively sophisticated manage restrict the mortality of fisheries species. For this reason this report has focussed Nonetheless, trade restrictions may be useful in curtailing the increase in exploita cialty products such as fins, liver oil and cartilage. These products come from a w trawl fisheries where chondrichthyans are not the target species and their catch i are mostly all exported and as such international trade restrictions could control measures may also increase wastage of catch which in many cases is dead, or will

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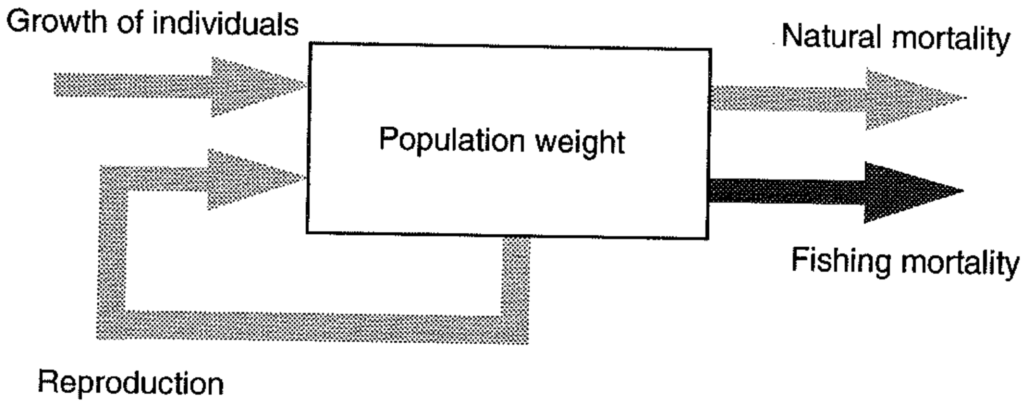
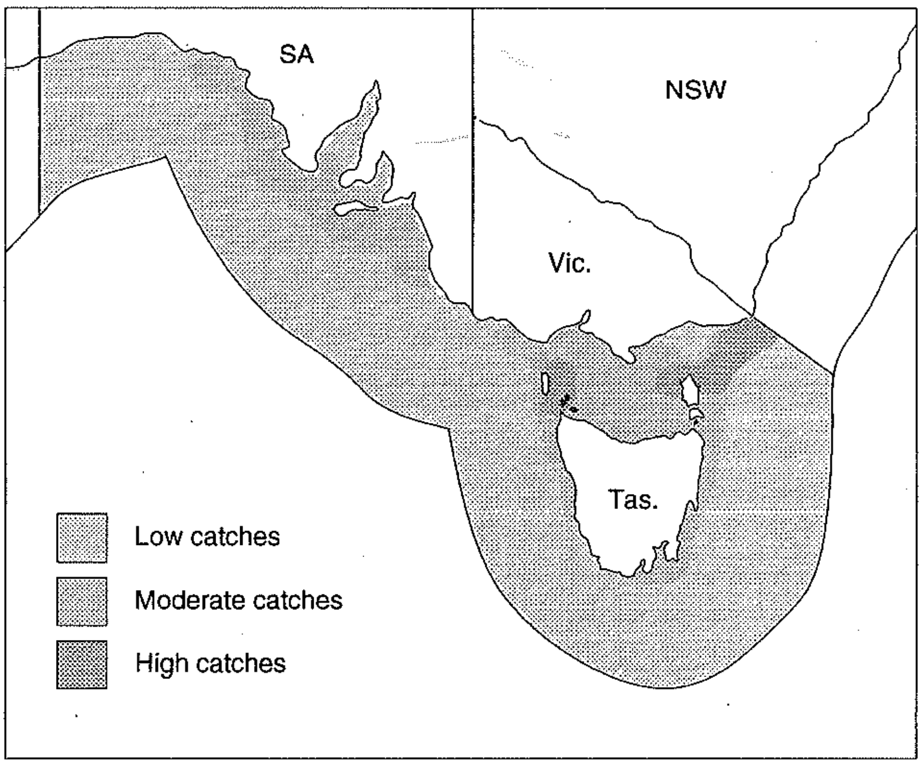


Figure 1. Simplified representation of the dynamics of an exploited population



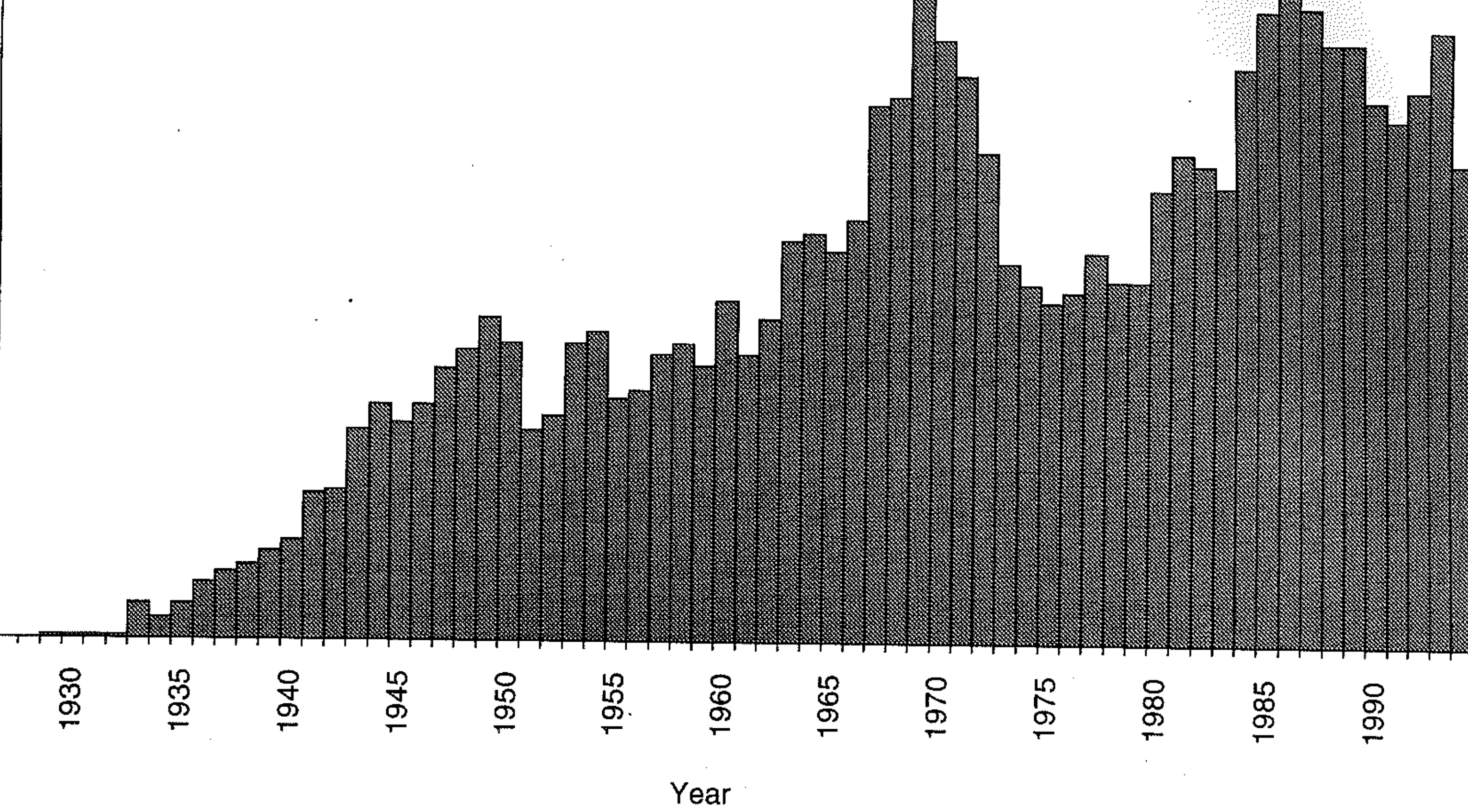
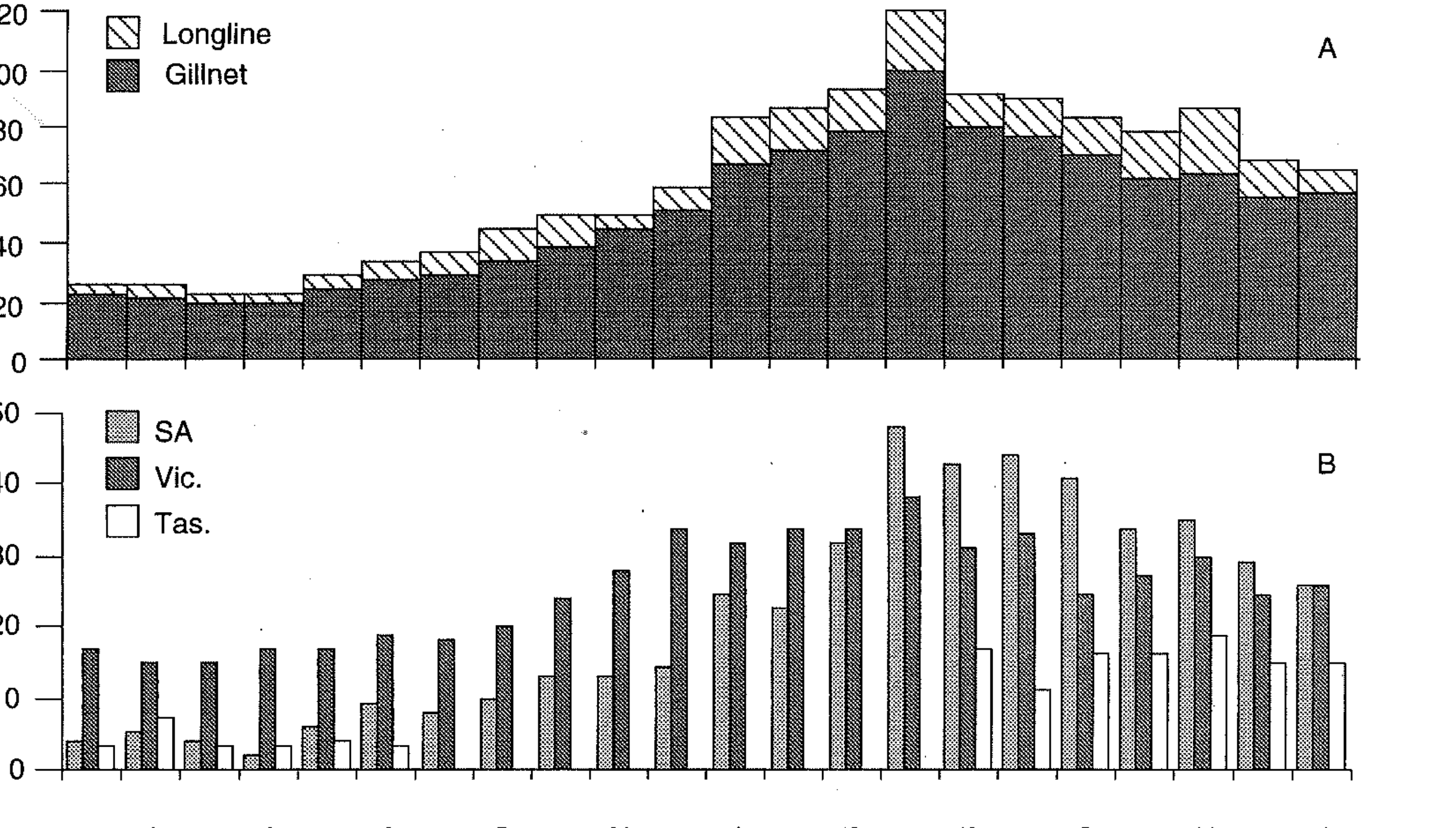


Figure 3. Combined catch (live weight) of school and gummy shark in the SSF (Data from Stevens 1993 and Walker *et al* 1995).



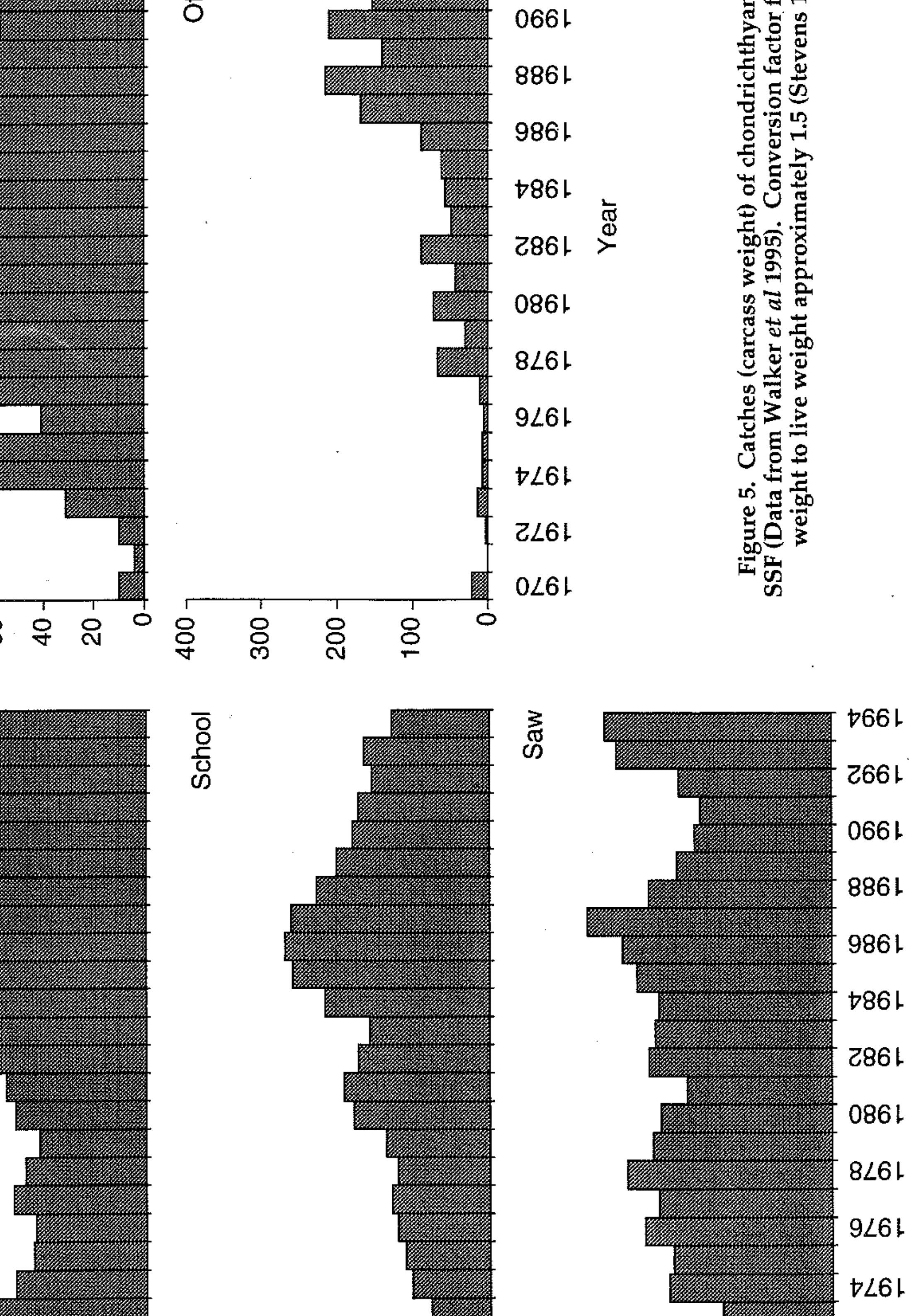
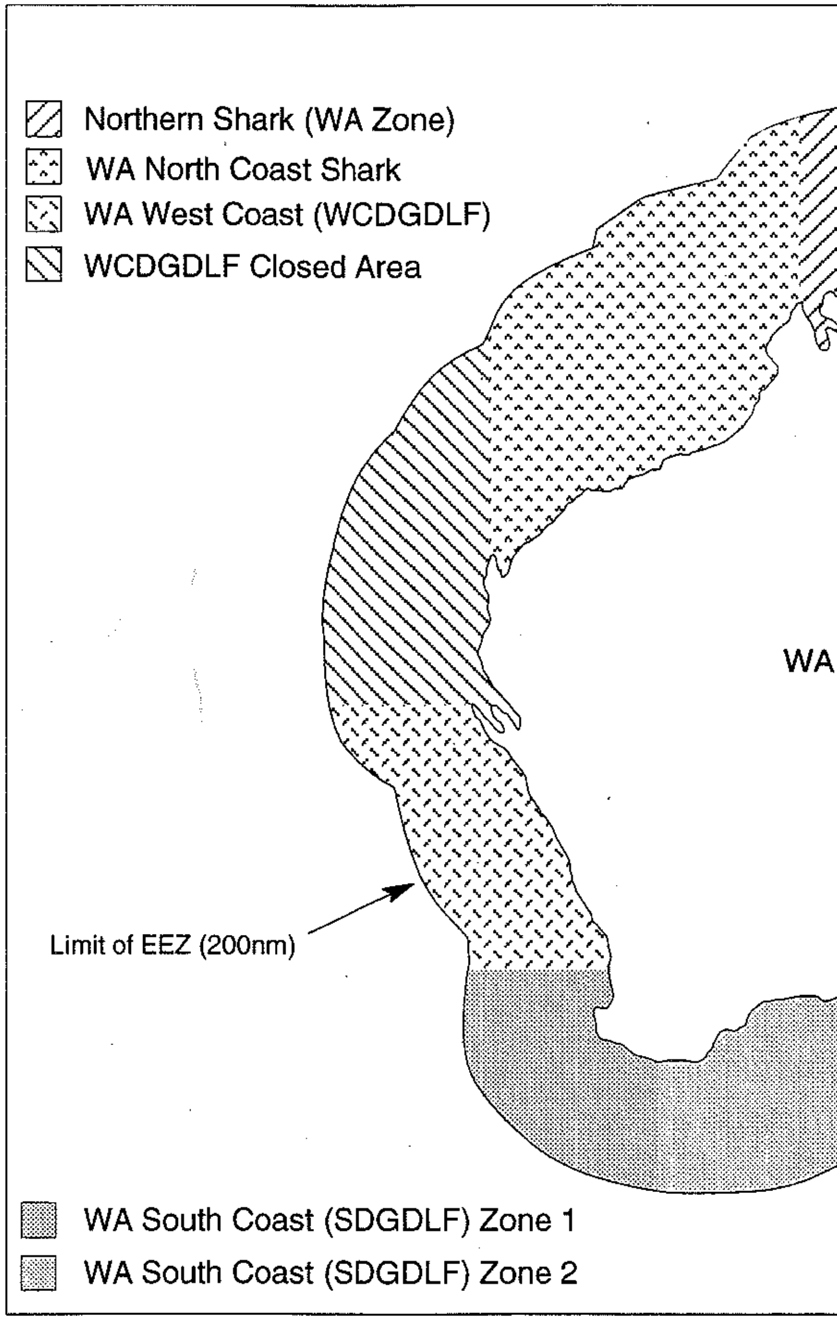
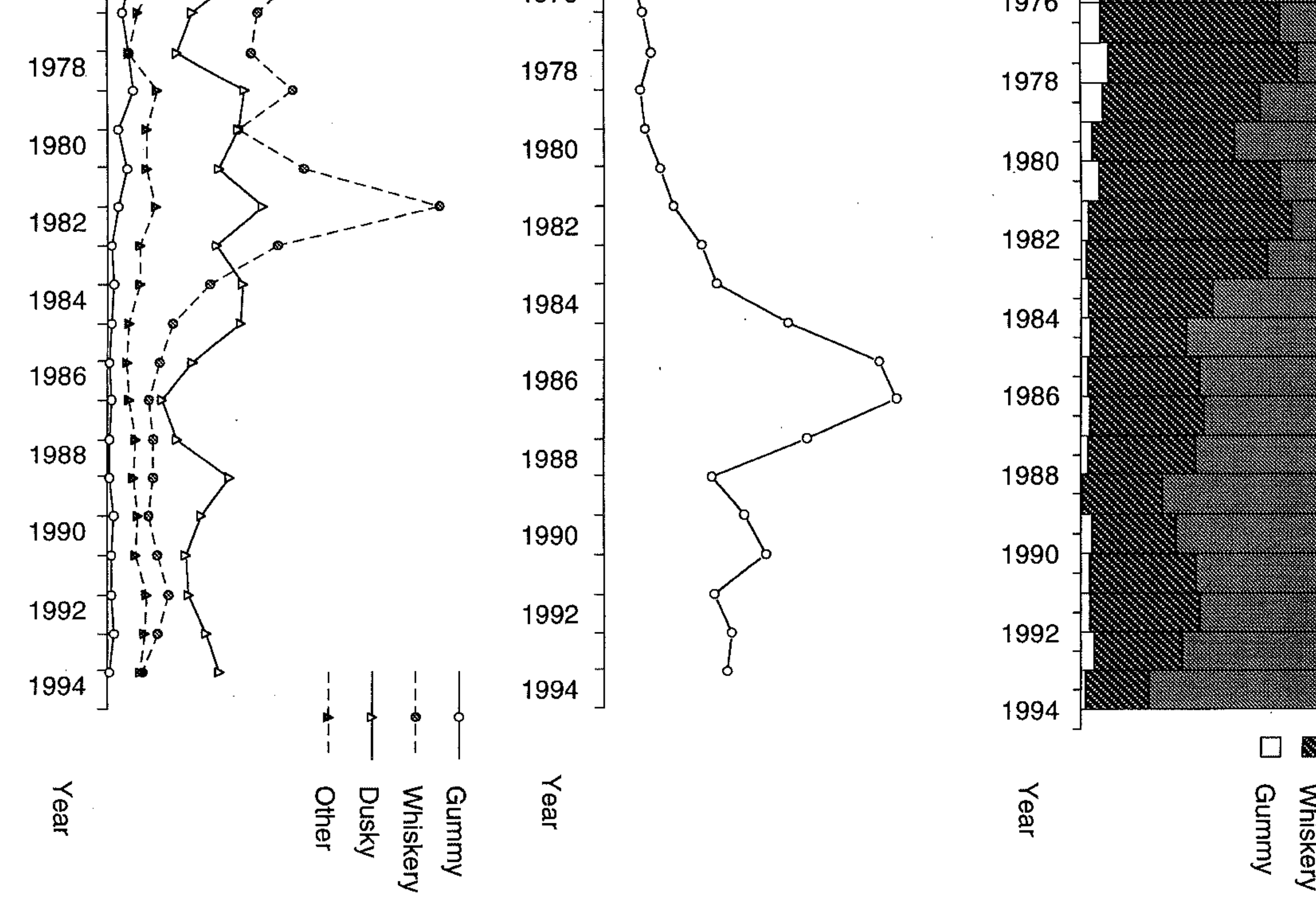
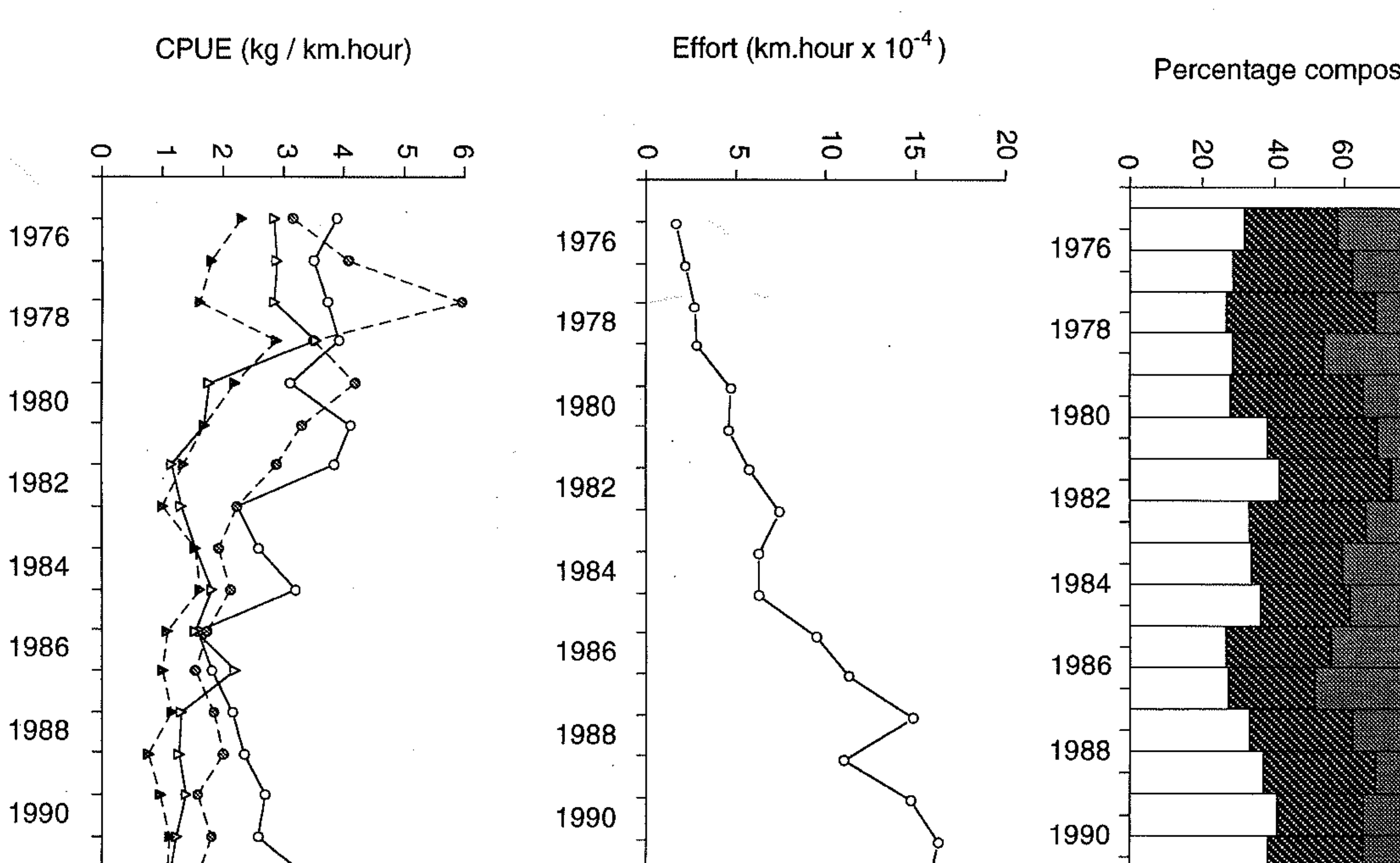
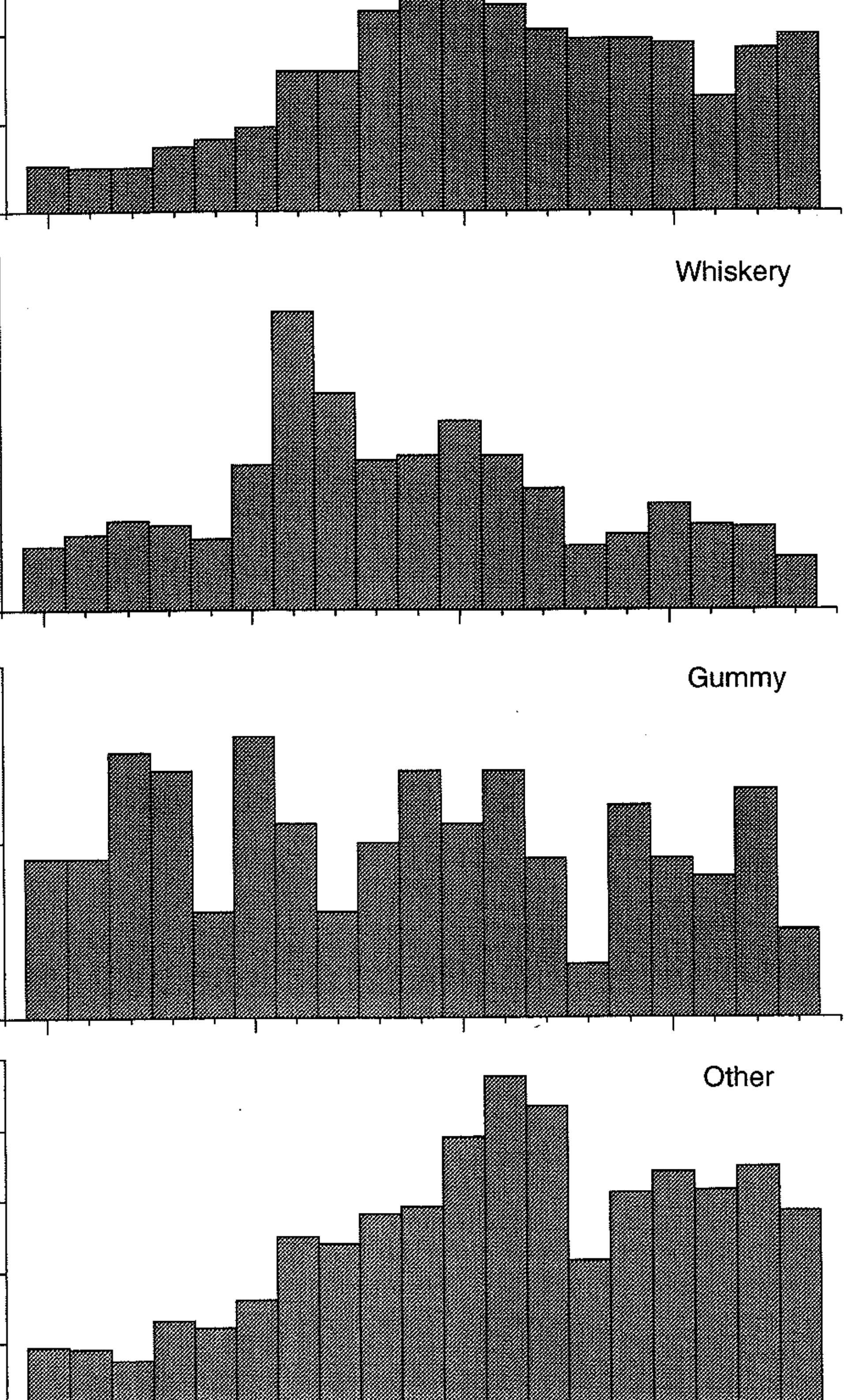


Figure 5. Catches (carcass weight) of chondrichthyar
SSF (Data from Walker *et al* 1995). Conversion factor f
weight to live weight approximately 1.5 (Stevens 1

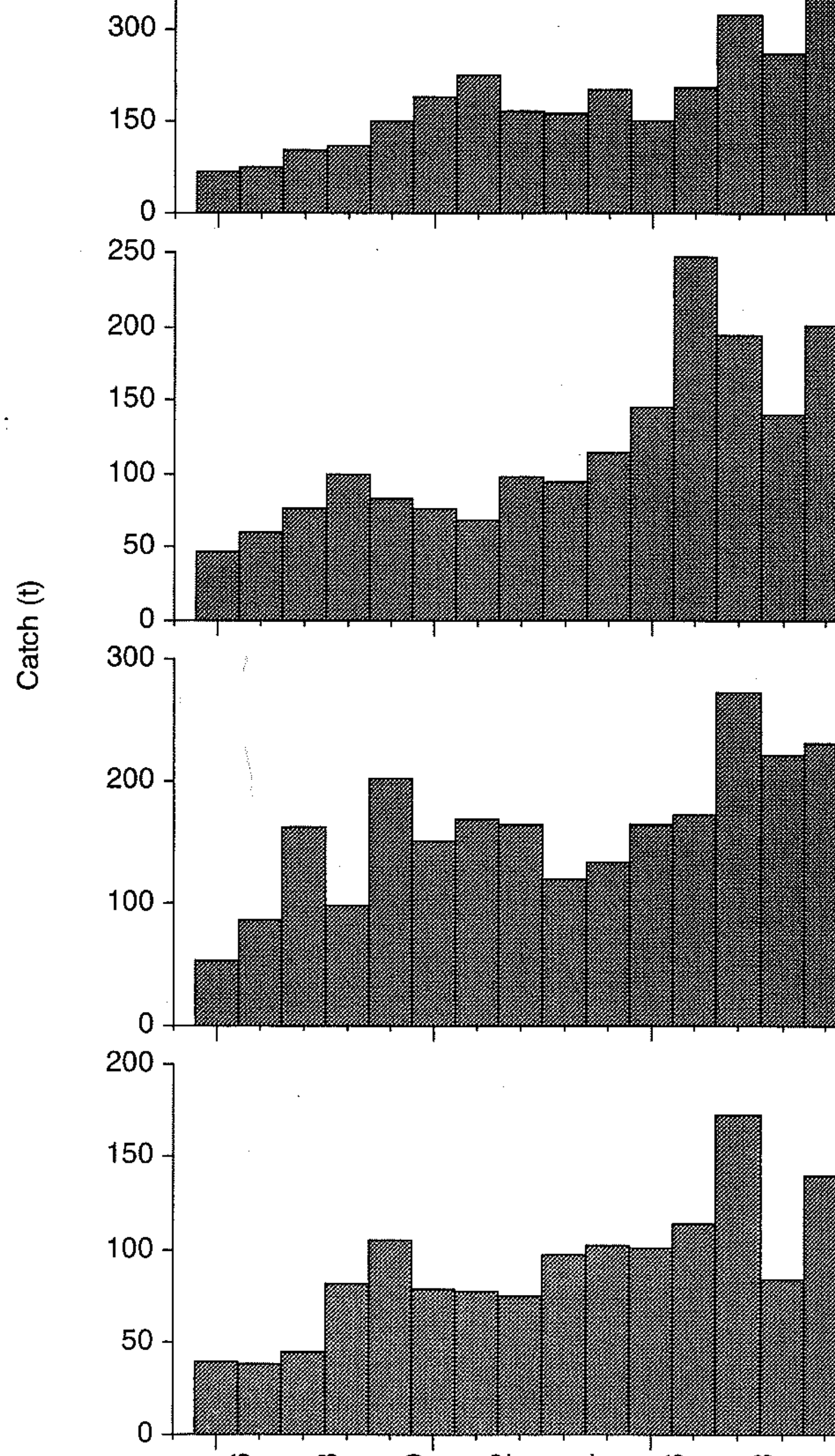



Year
Gummy
Whiskery
Dusky
Other
Year
Year
Gummy
Whiskery

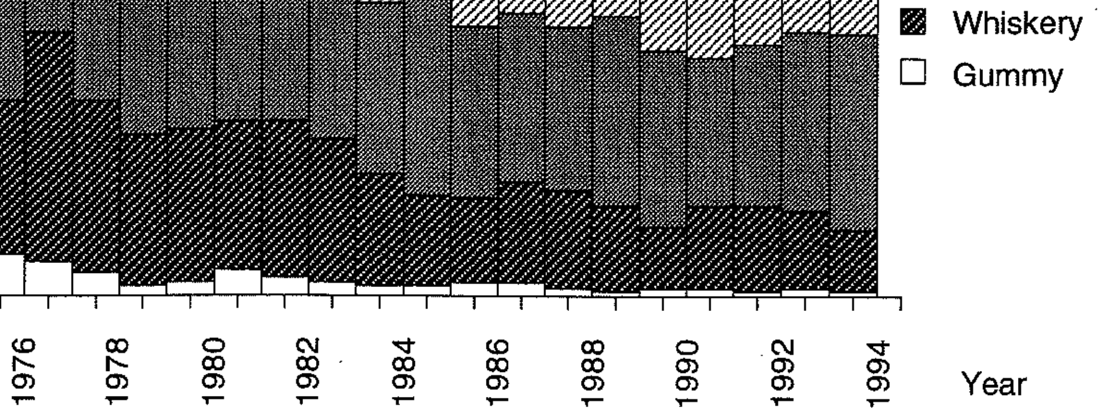

CPUE (kg / km.hour)
Effort (km.hour x 10^{-4})
Percentage compos

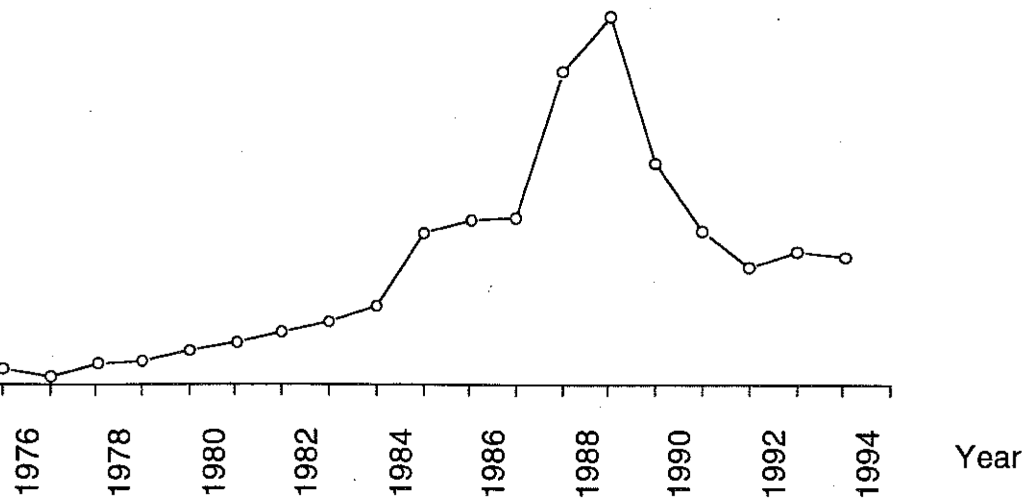


Whiskery
Gummy
Other



Catch (t)
300
150
0
250
200
150
100
50
0
300
200
100
0
200
150
100
50
0


Whiskery
Gummy
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
Year


1976
1978
1980
1982
1984
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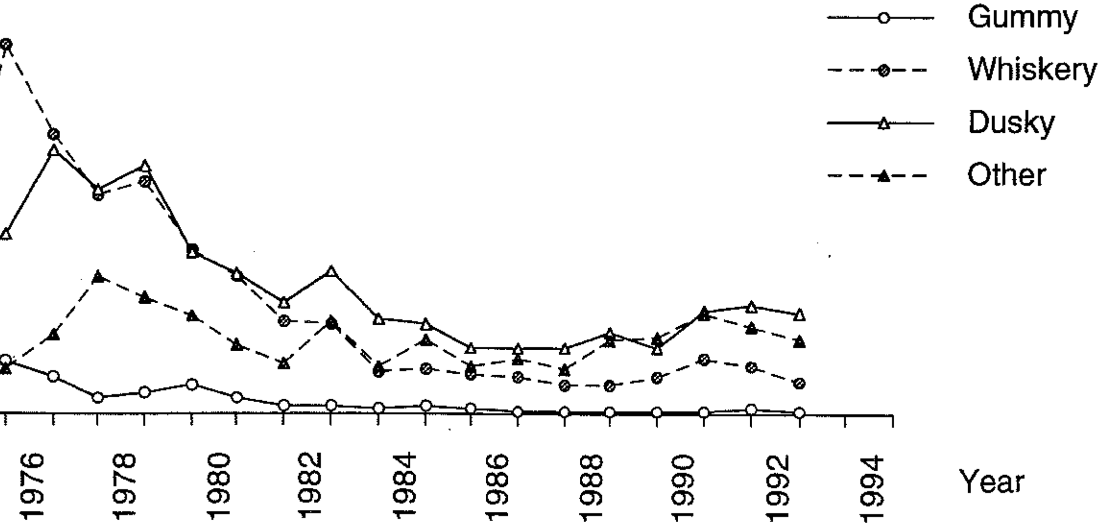
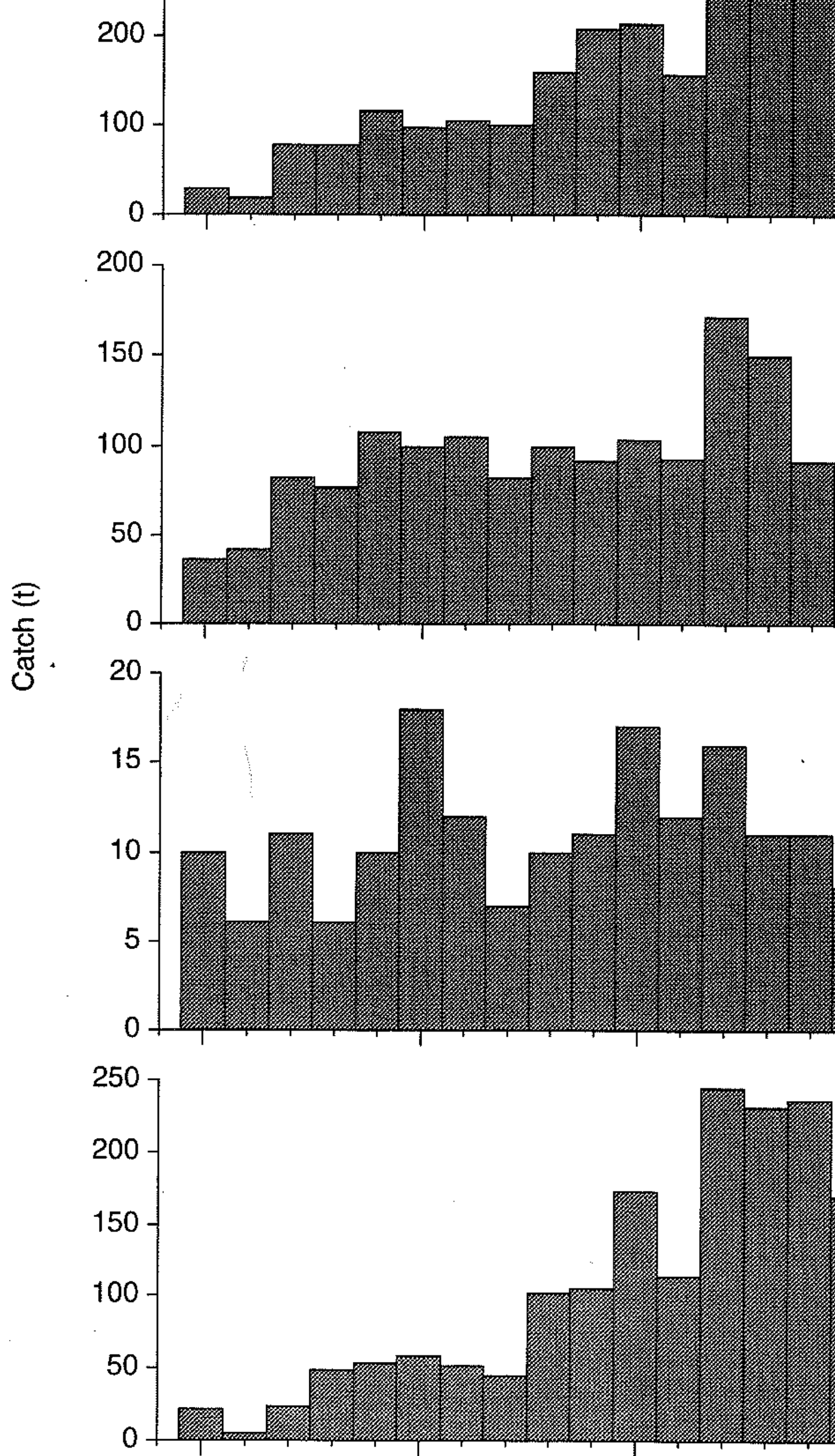
1992
1994
Year


Gummy
Whiskery
Dusky
Other
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
Year


Catch (t)
200
100
0
200
150
100
50
0
20
15
10
5
0
250
200
150
100
50
0

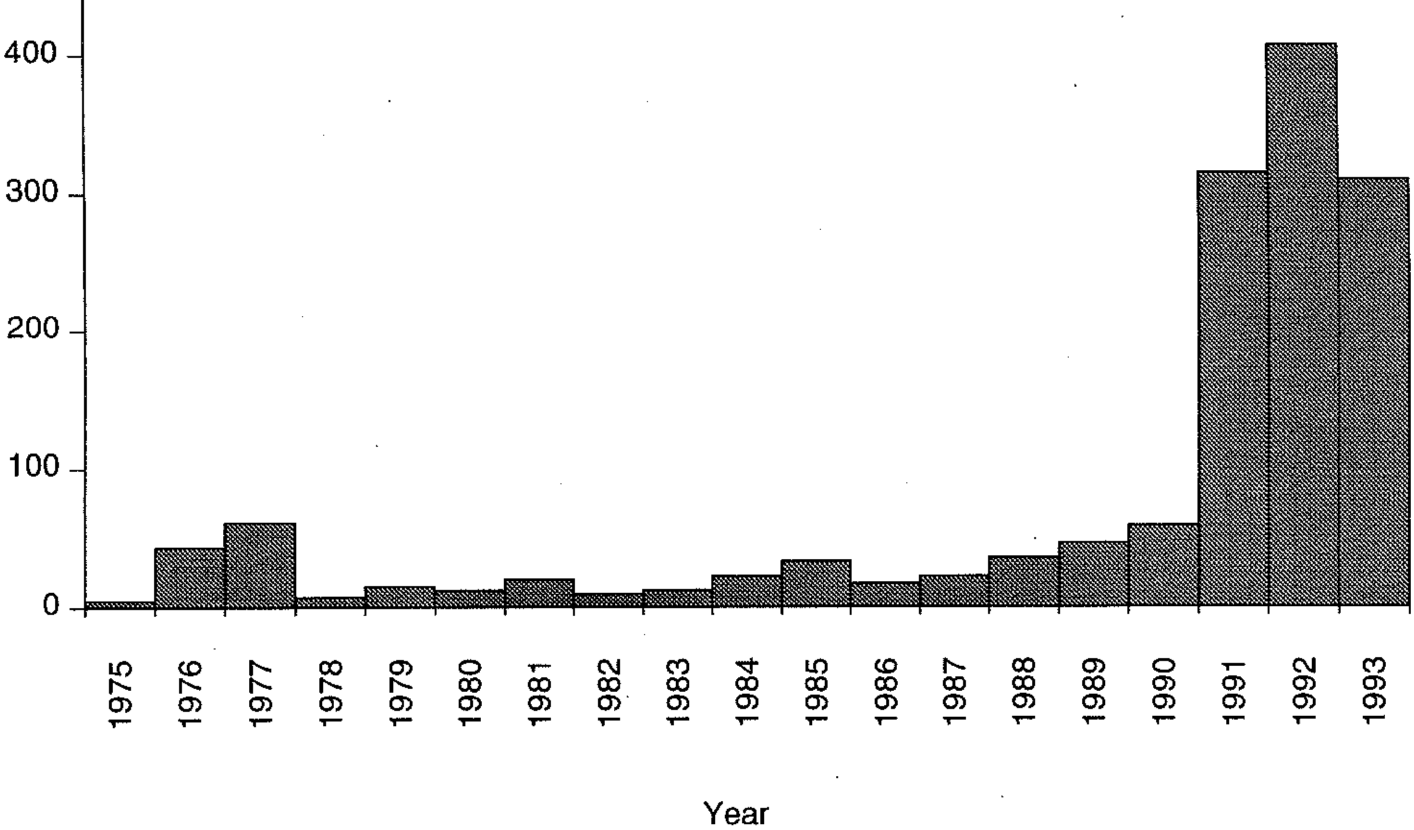


Figure 13. Total catch (live weight) in the WA North Coast Shark Fishery (Data from C. Simpfendorfer, *in litt.* 1995).

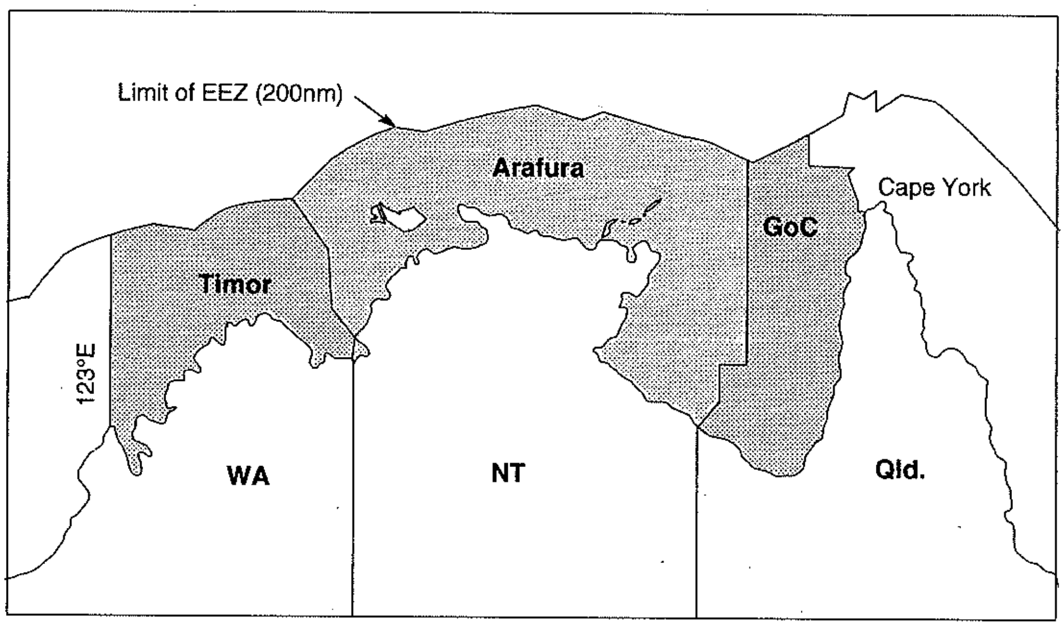
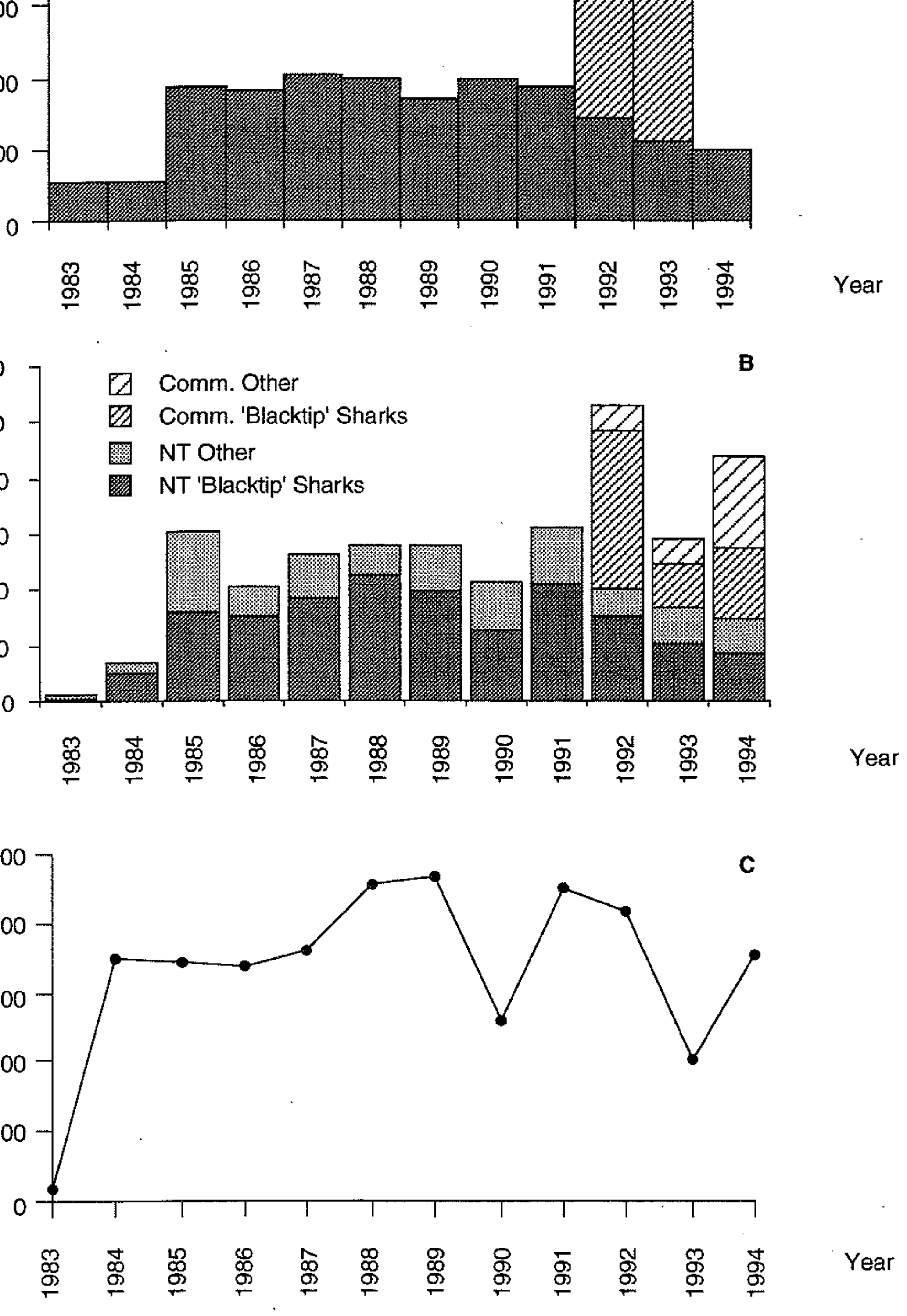


Figure 14. Map of the zones in the Northern Shark Fishery



5. Changes in effort, catch and catch rates in the Northern Shark Fishery,

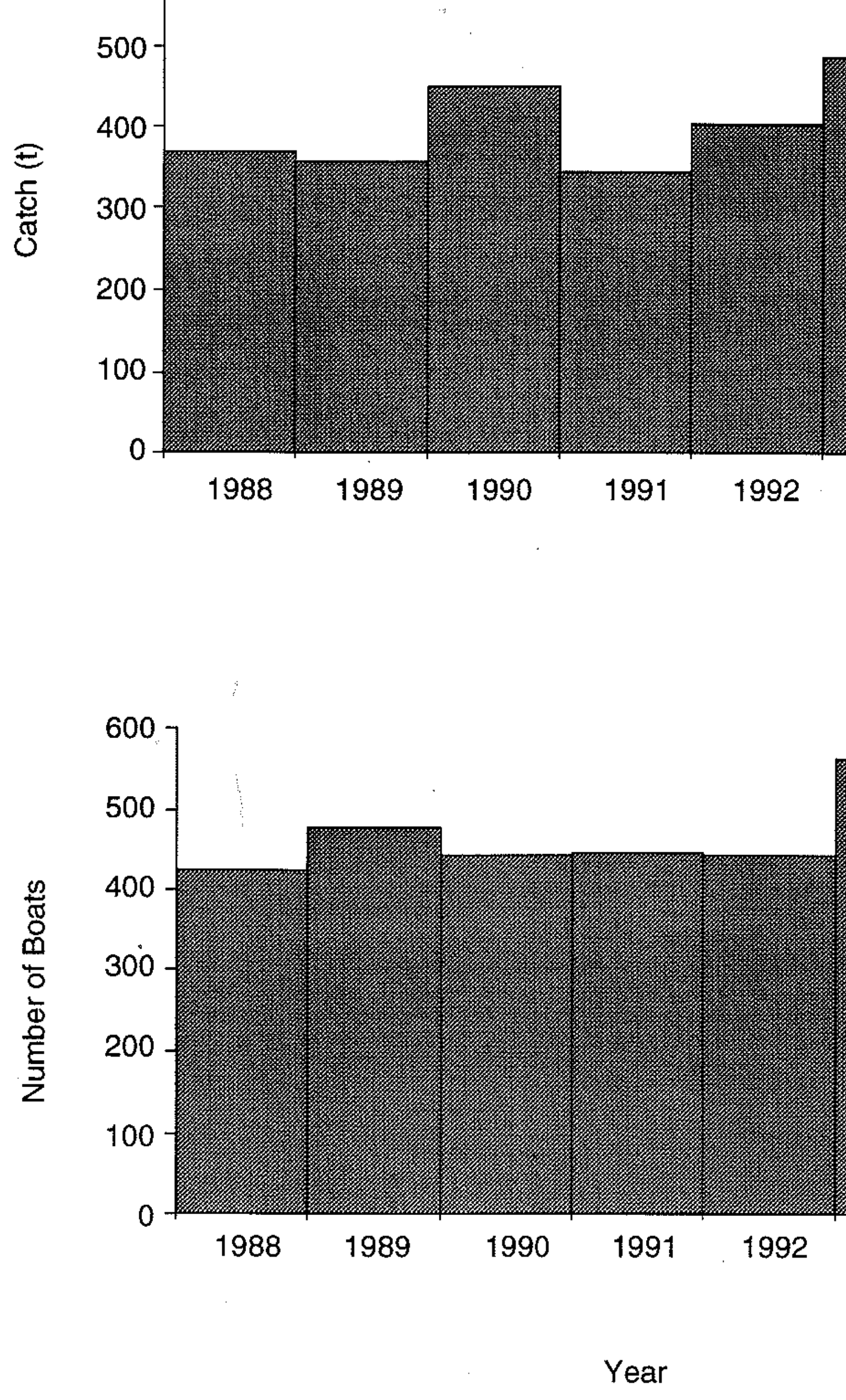


Figure 16. Catch (carcass weight) and the numb
taking sharks on the east coast of Queensland (b

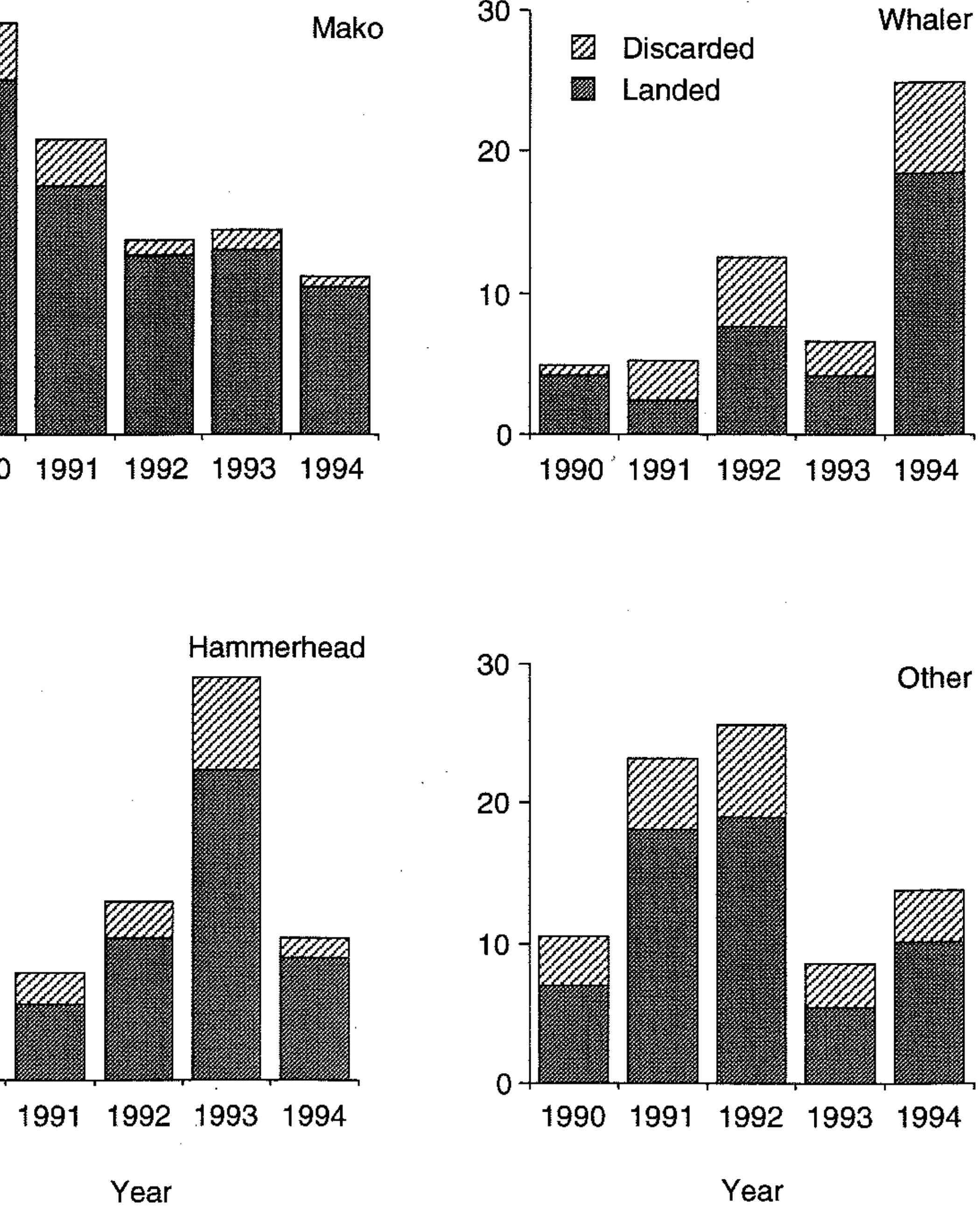
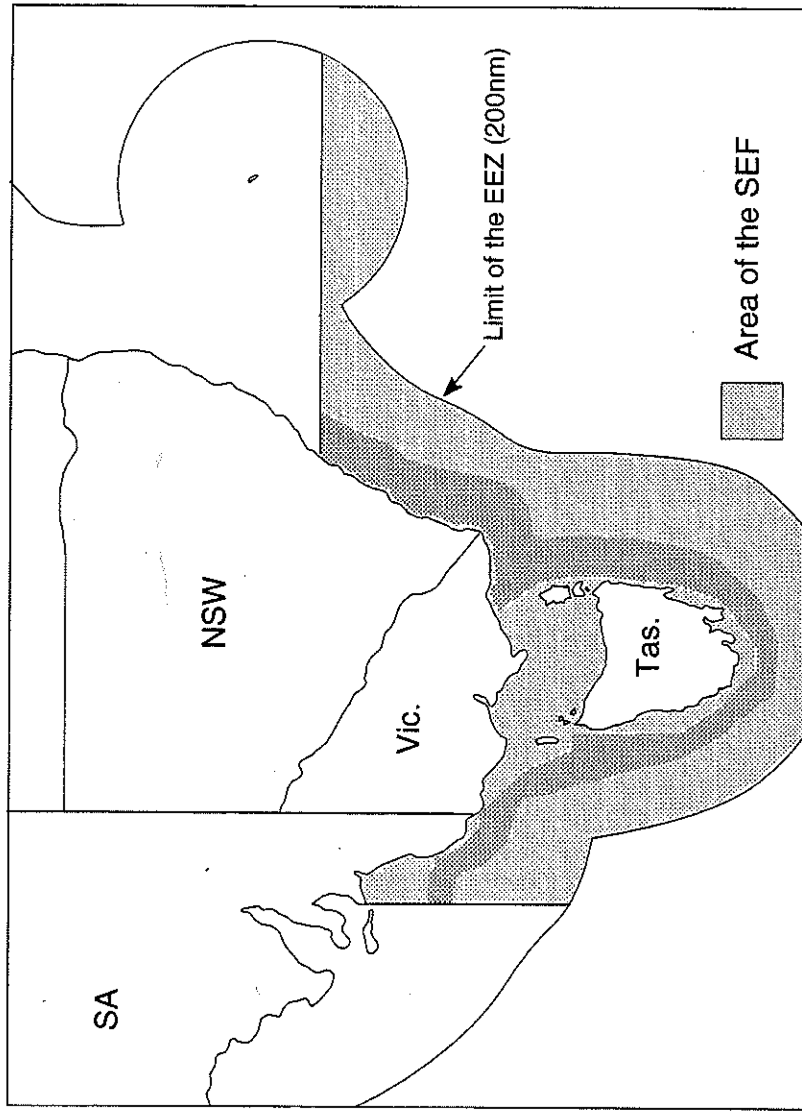
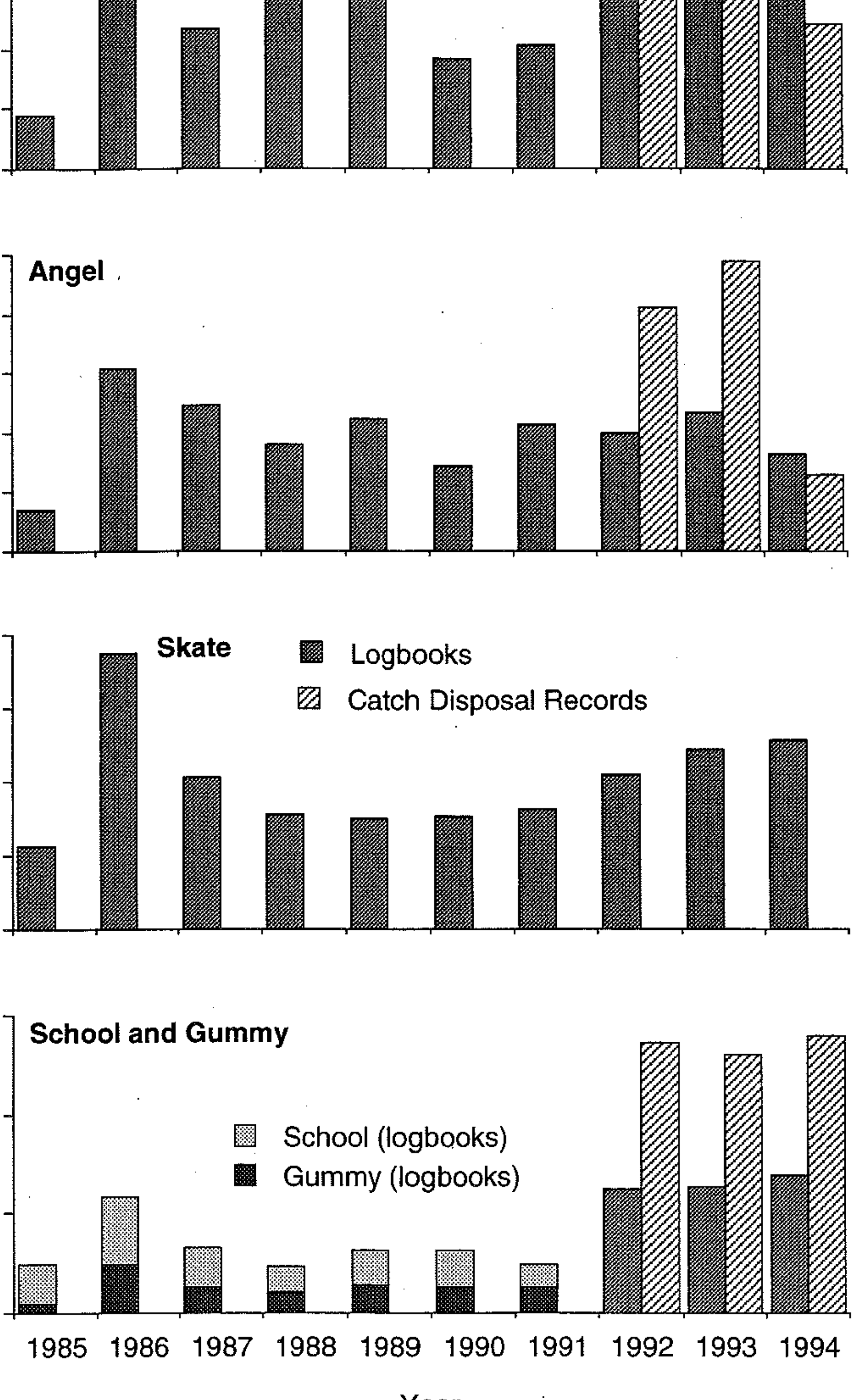
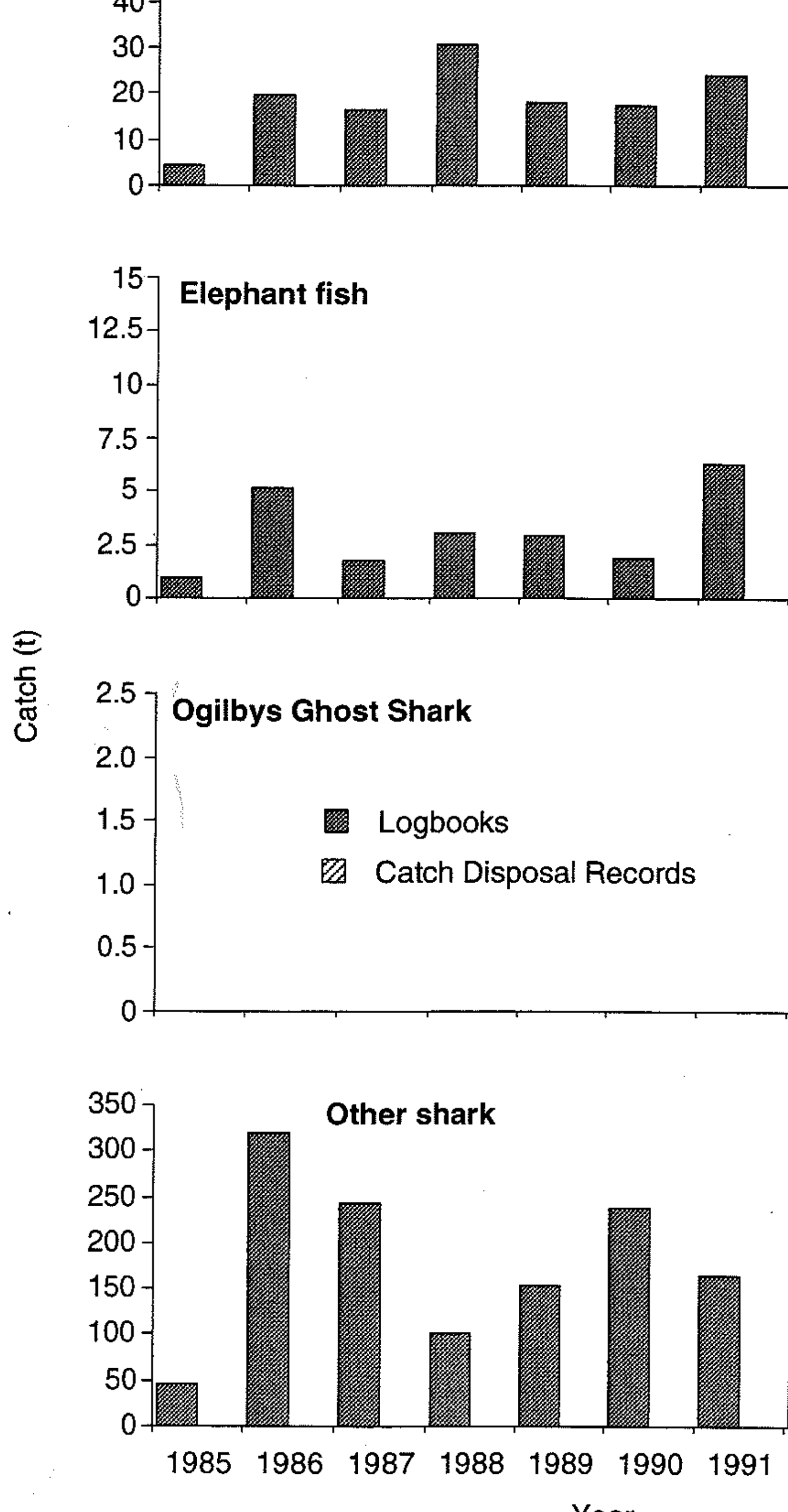


Figure 17. Reported catches of sharks by domestic tuna longliners off the east coast of Australia (Incorporates bycatches from the East Coast and Southern Bluefin Tuna Fisheries). The weight of discarded individuals is unavailable but was calculated here from the ratio of the number of individuals retained to the number discarded. This assumes that the

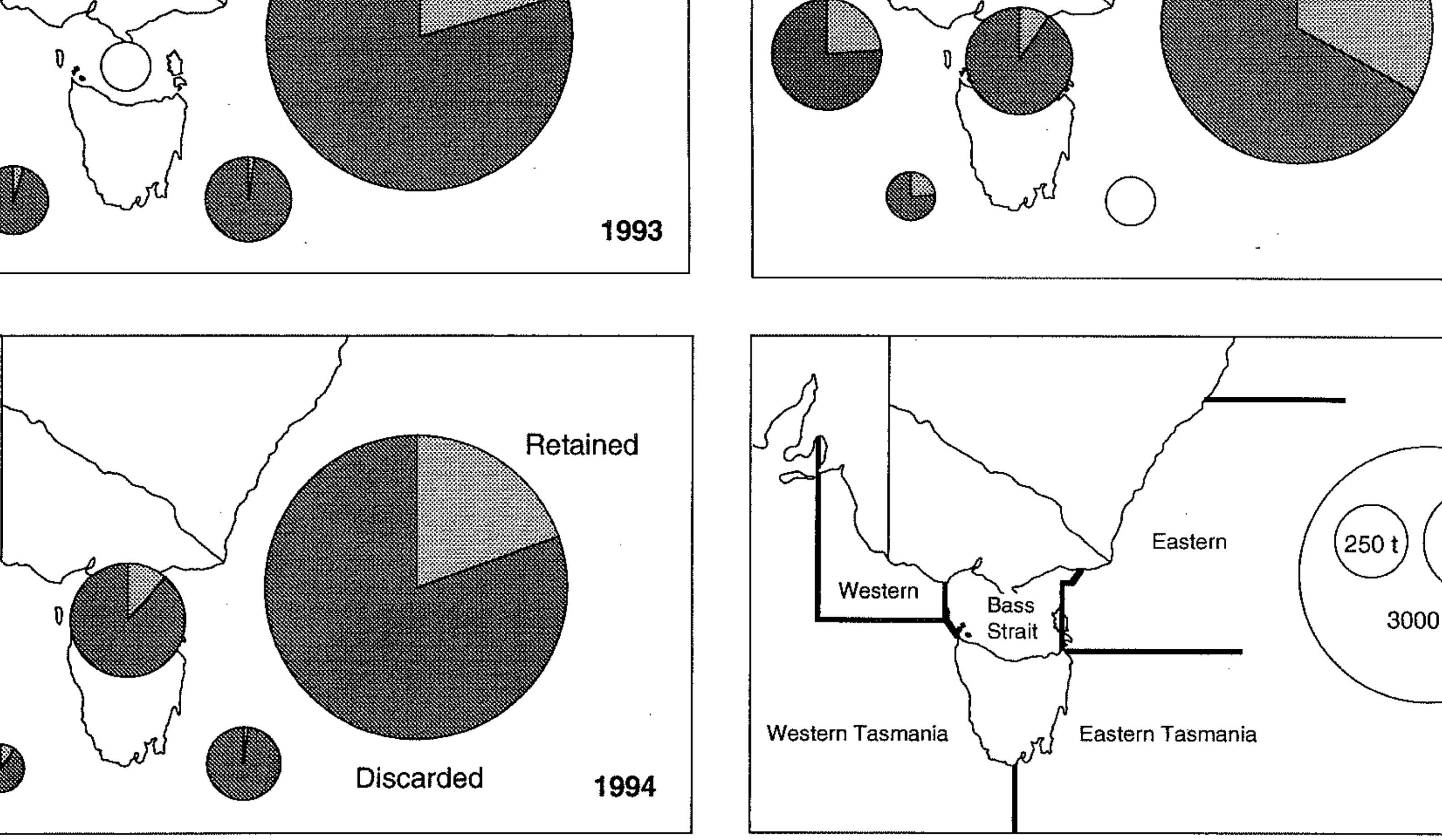




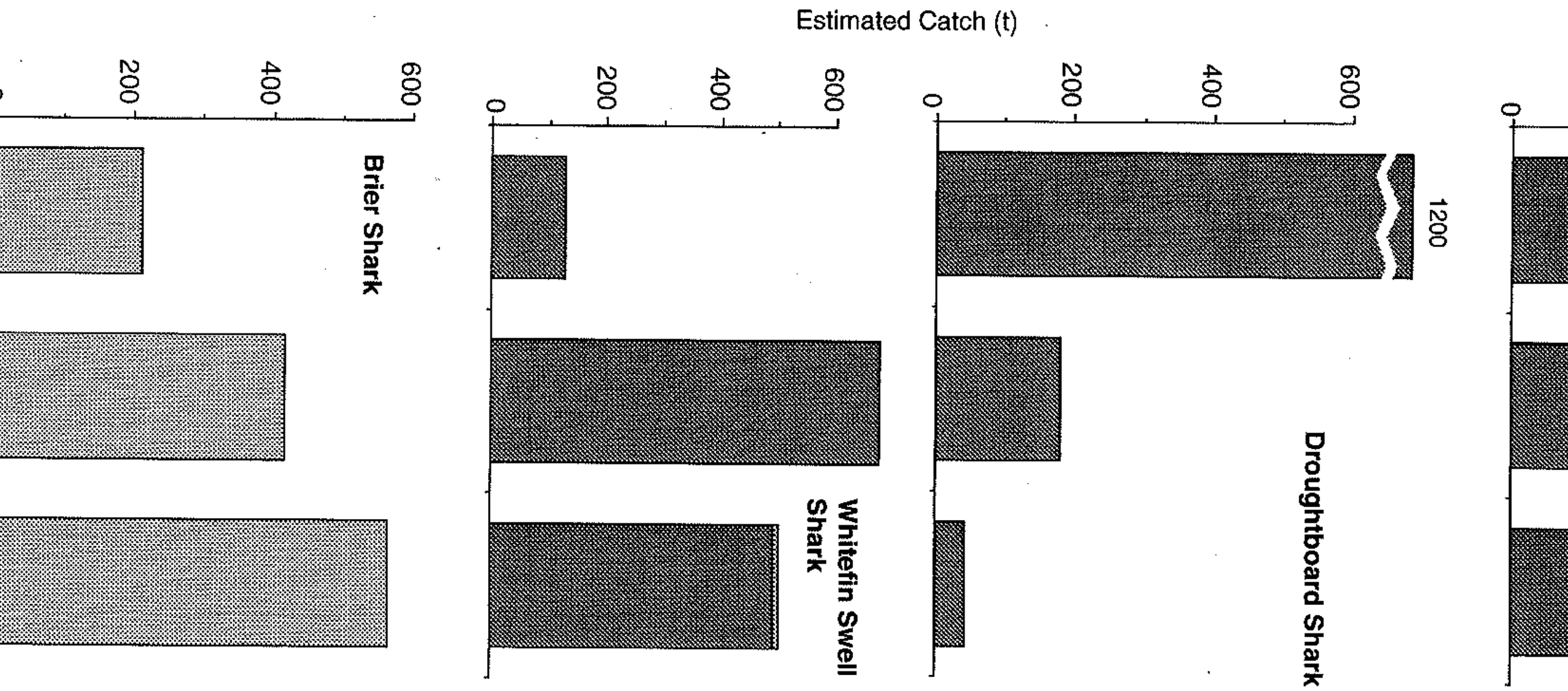
Angel
Skate
Logbooks
Catch Disposal Records
School and Gummy
School (logbooks)
Gummy (logbooks)
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994

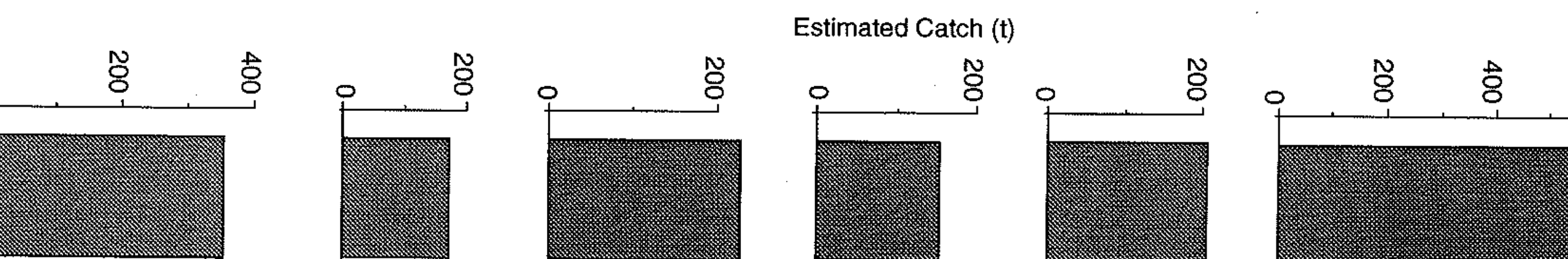


Catch (t)
Elephant fish
Ogilbys Ghost Shark
Logbooks
Catch Disposal Records
Other shark
1985
1986
1987
1988
1989
1990
1991



20. Estimated catches of chondrichthyans in the South East Fishery from 1993 to 1995. White circle indicates data not av
es for Bass Strait are from Danish seiners also fishing in part of the Eastern zone. (Calculated from data supplied by J. G
Bureau of Resource Sciences, *in litt.* 1996).





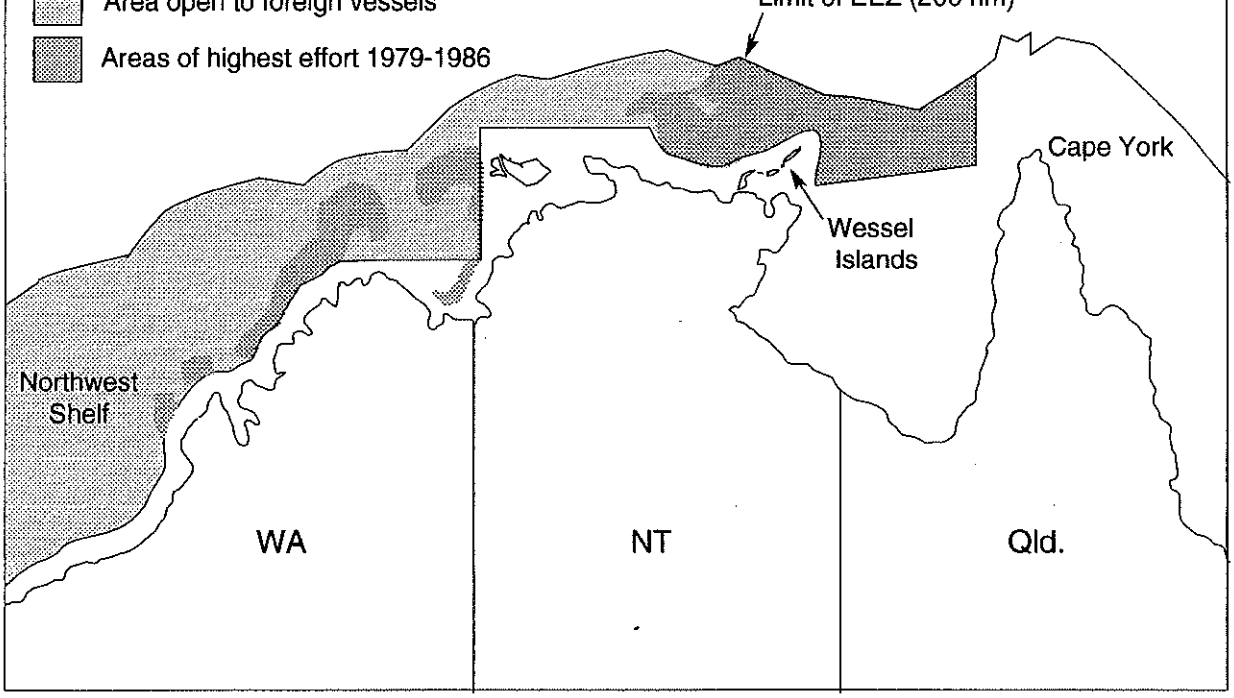


Figure 22. Map of the areas fished by Taiwanese gillnetters in northern Australian waters from 1974 to 1986 (Modified from Stevens and Davenport 1991)

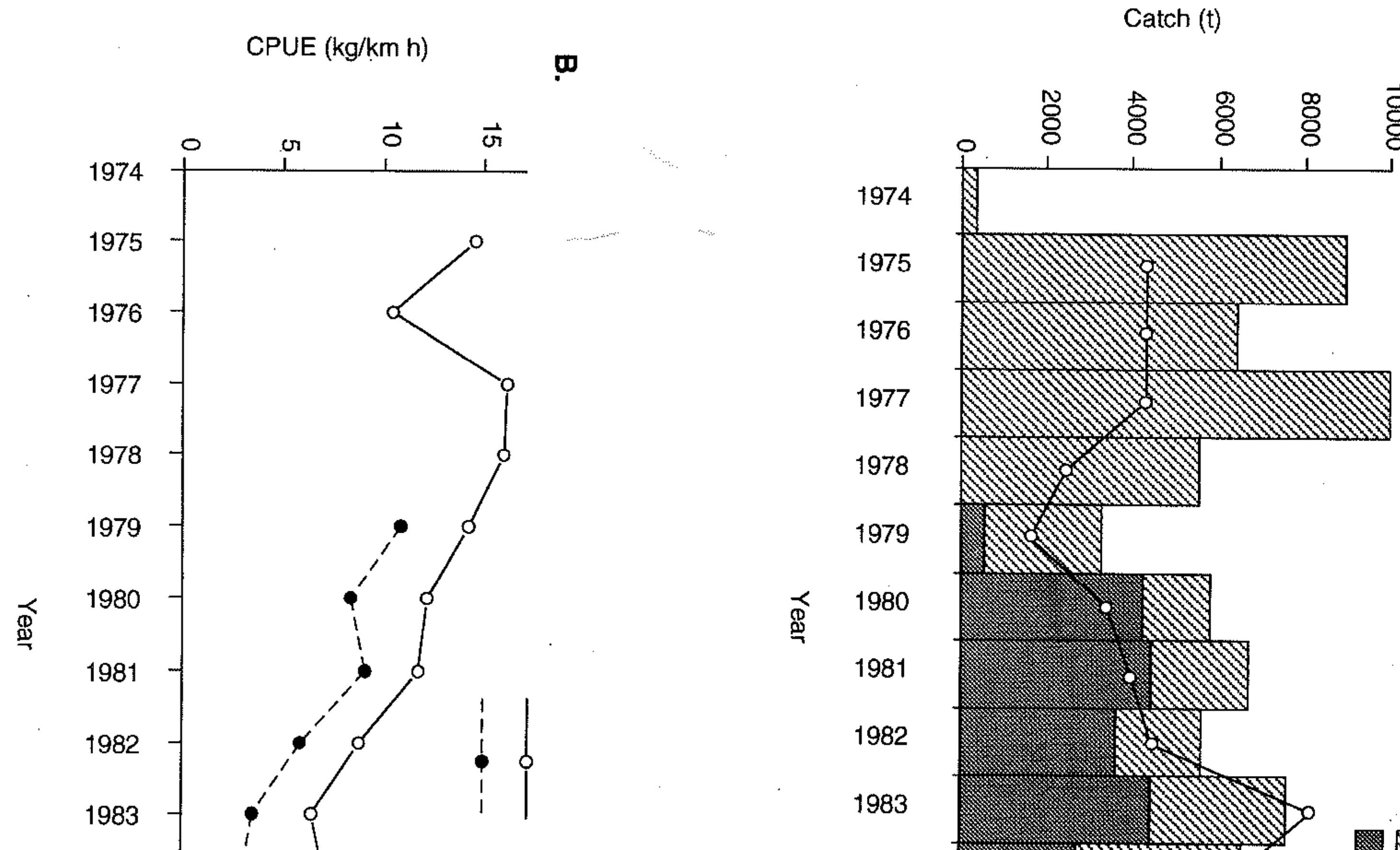
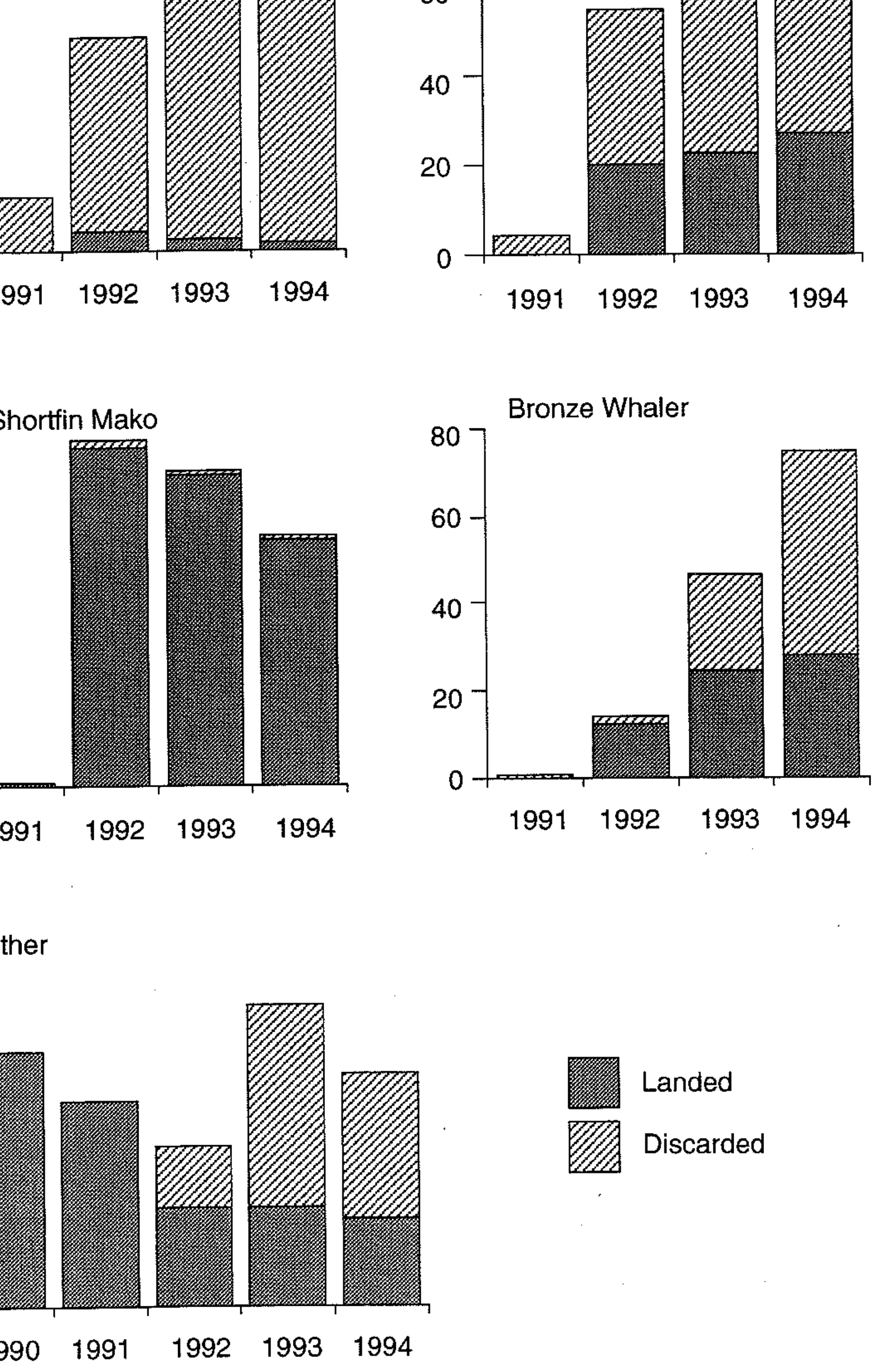


Figure 23. A. Annual catch (processed weight) and effort in th
fishery in northern Australia waters from 1974 to 1986. Note tha
1986 represent part of the year only. Shark catch is extrapola



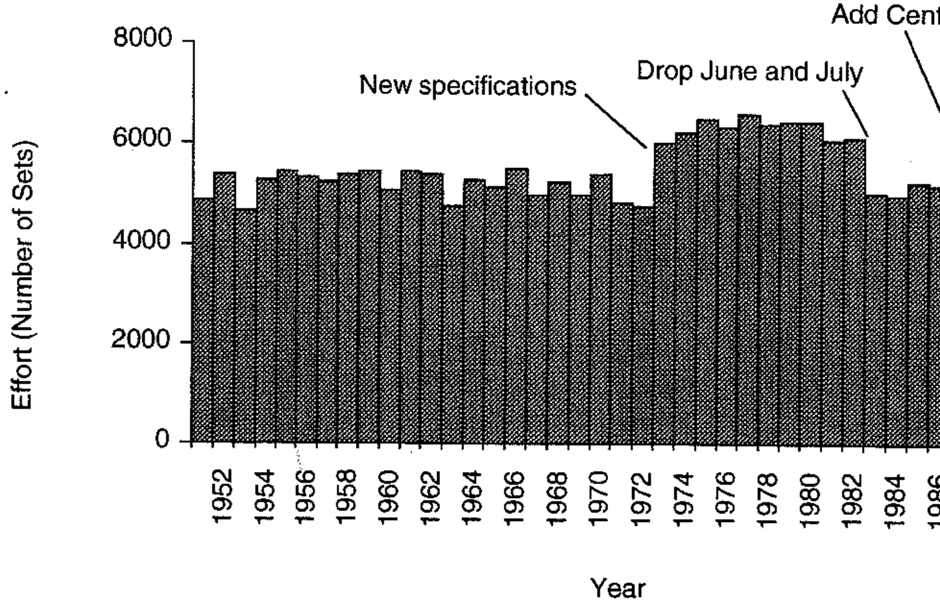
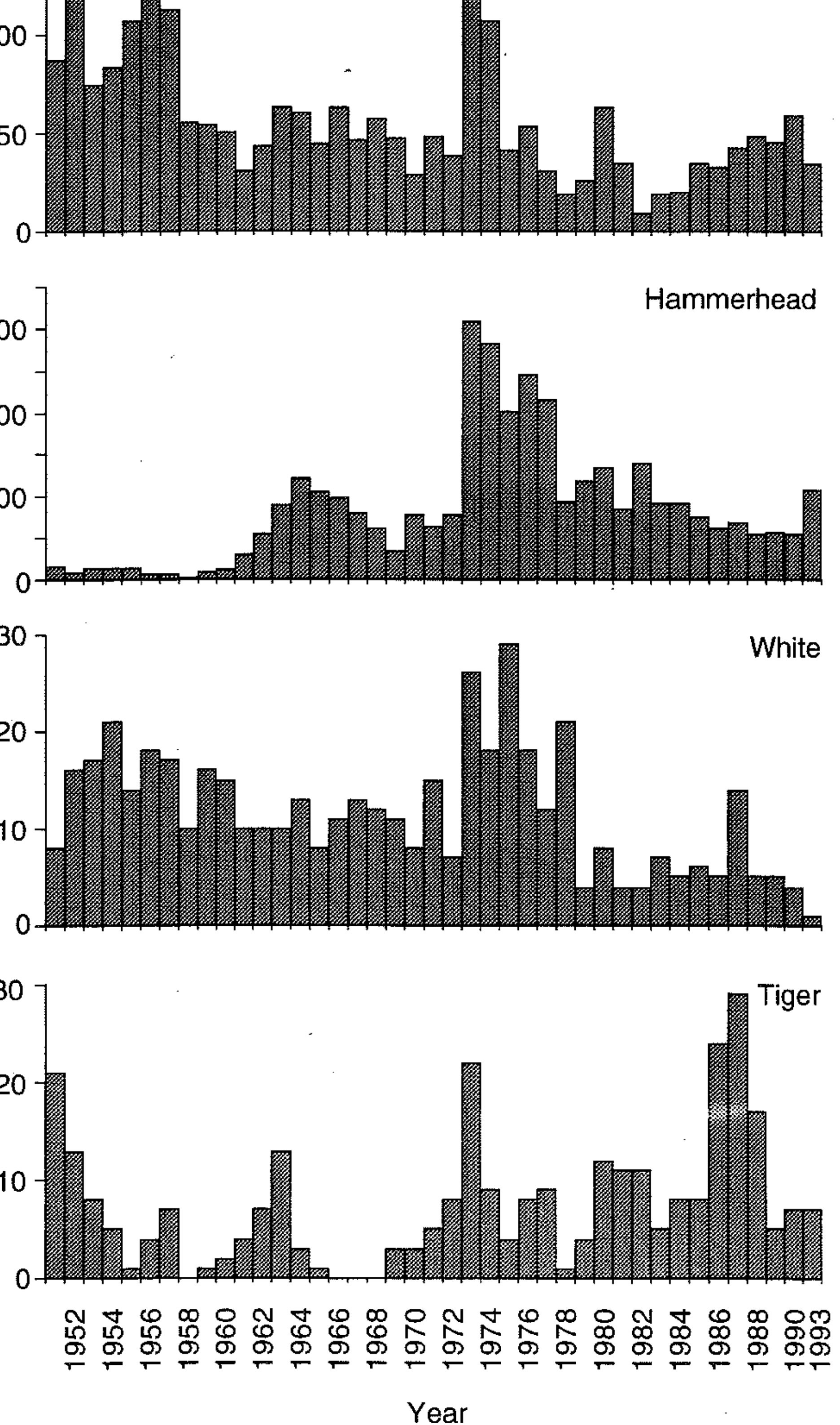
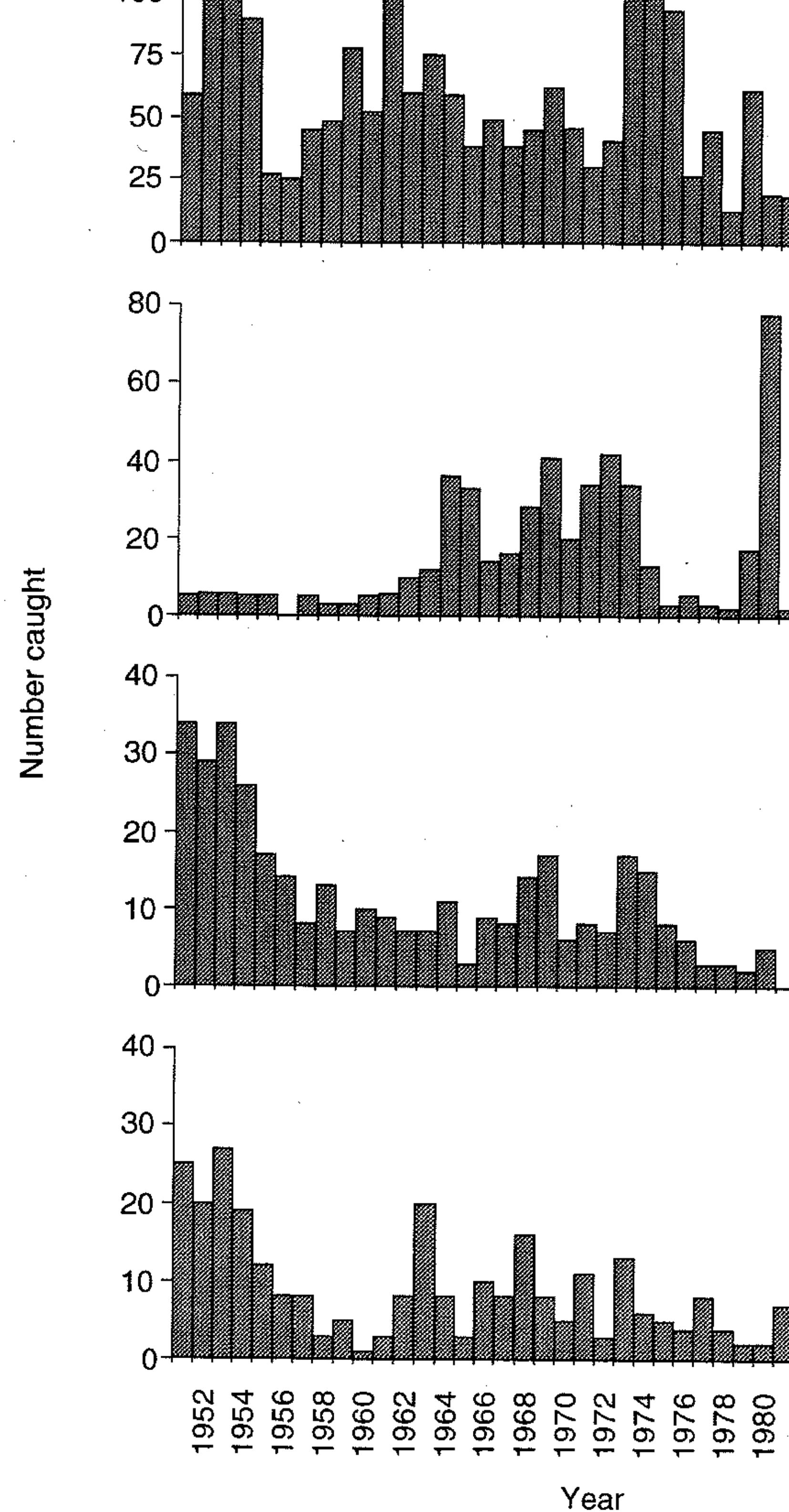
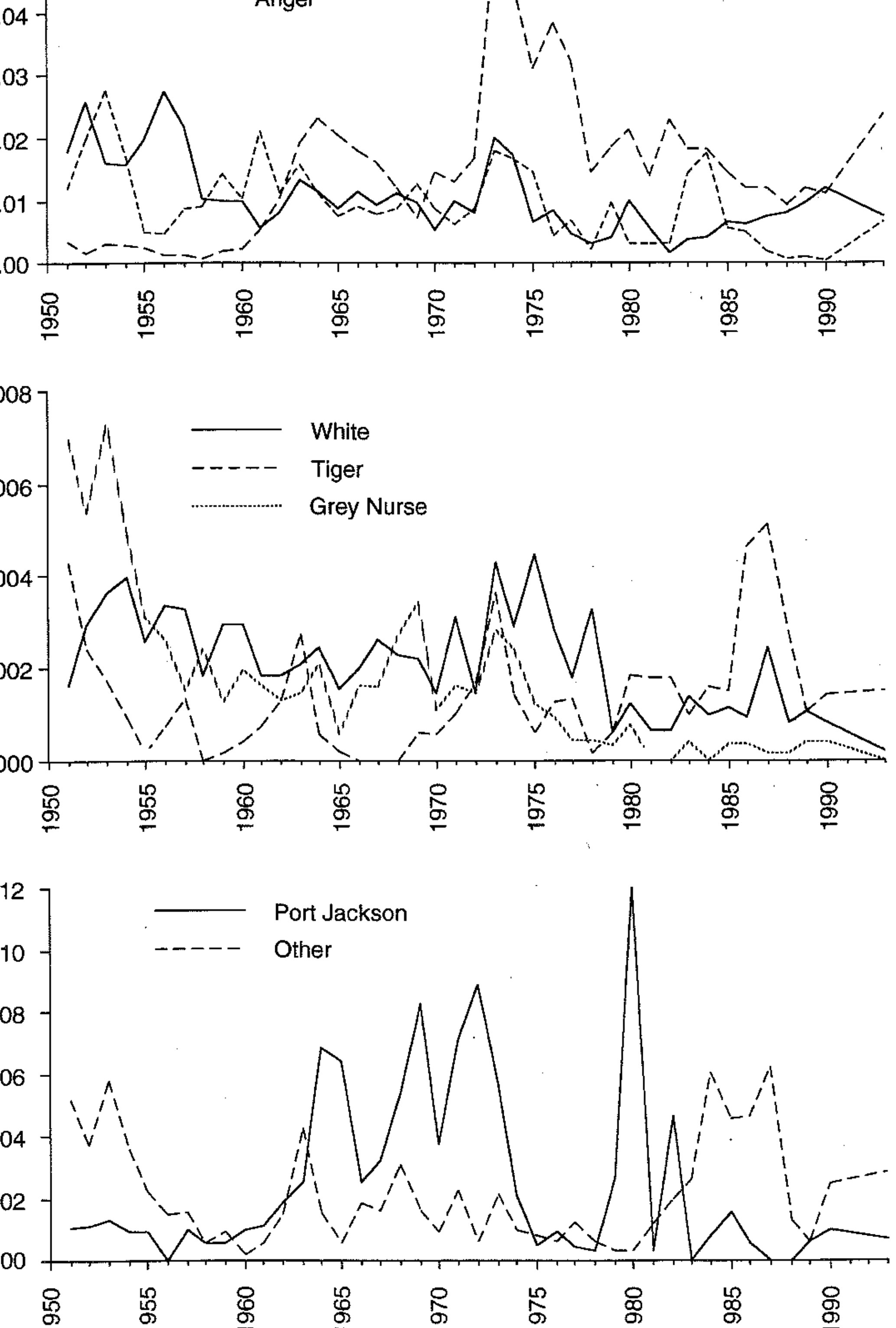
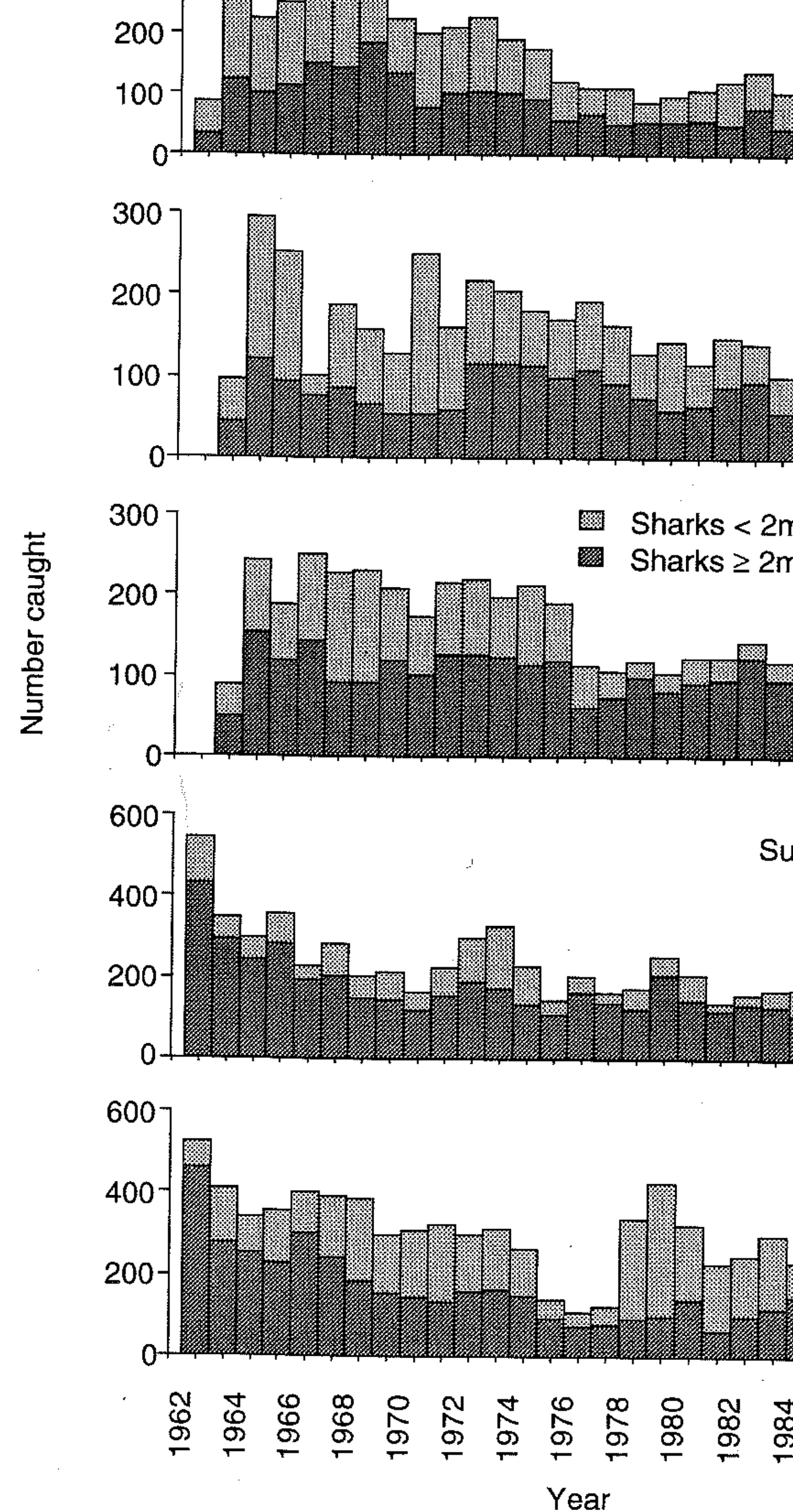


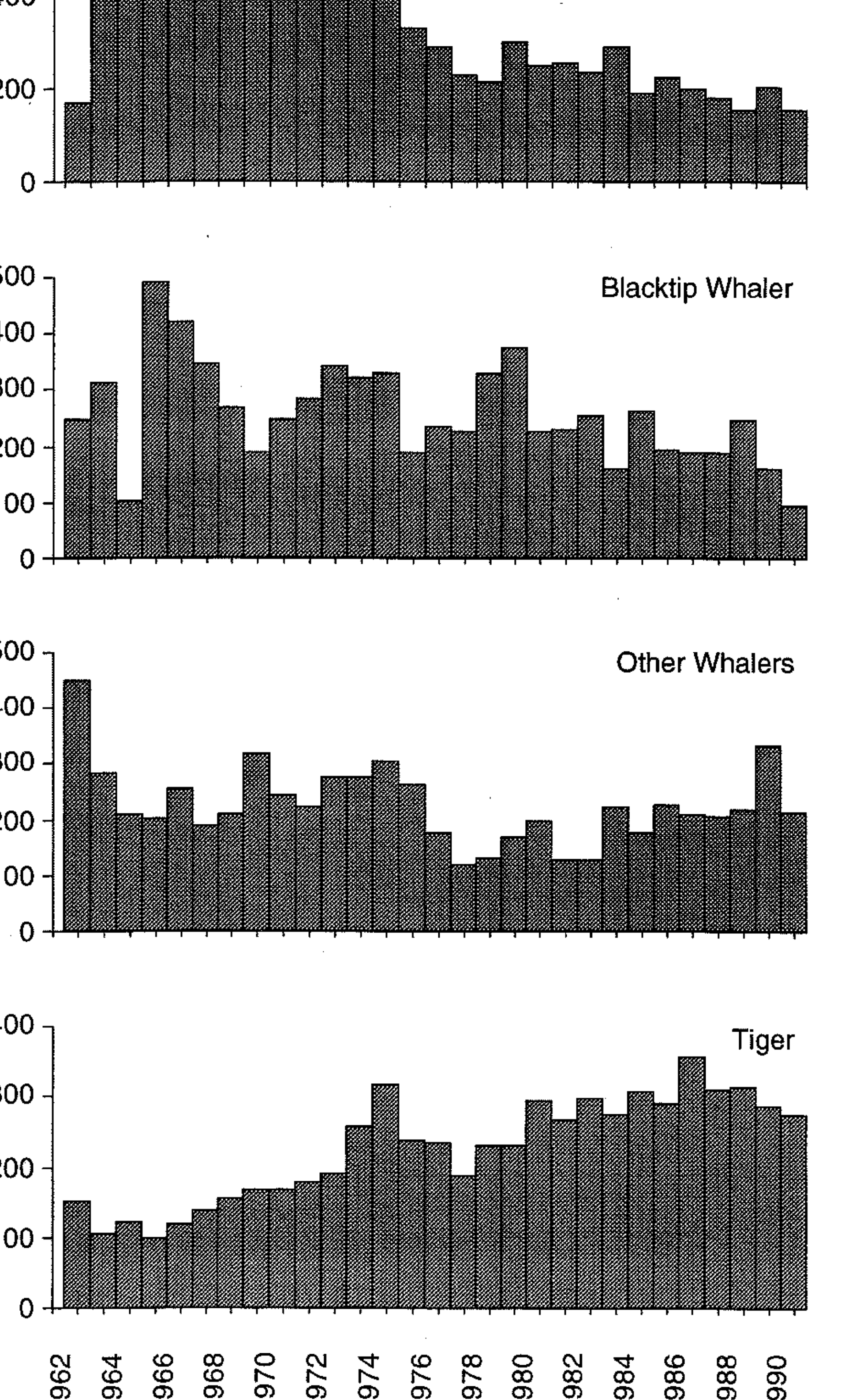
Figure 25. Changes in effort in the NSW Beach Meshing Progra
1993. Values for 1979 and 1980 are estimates. (Data from Stev

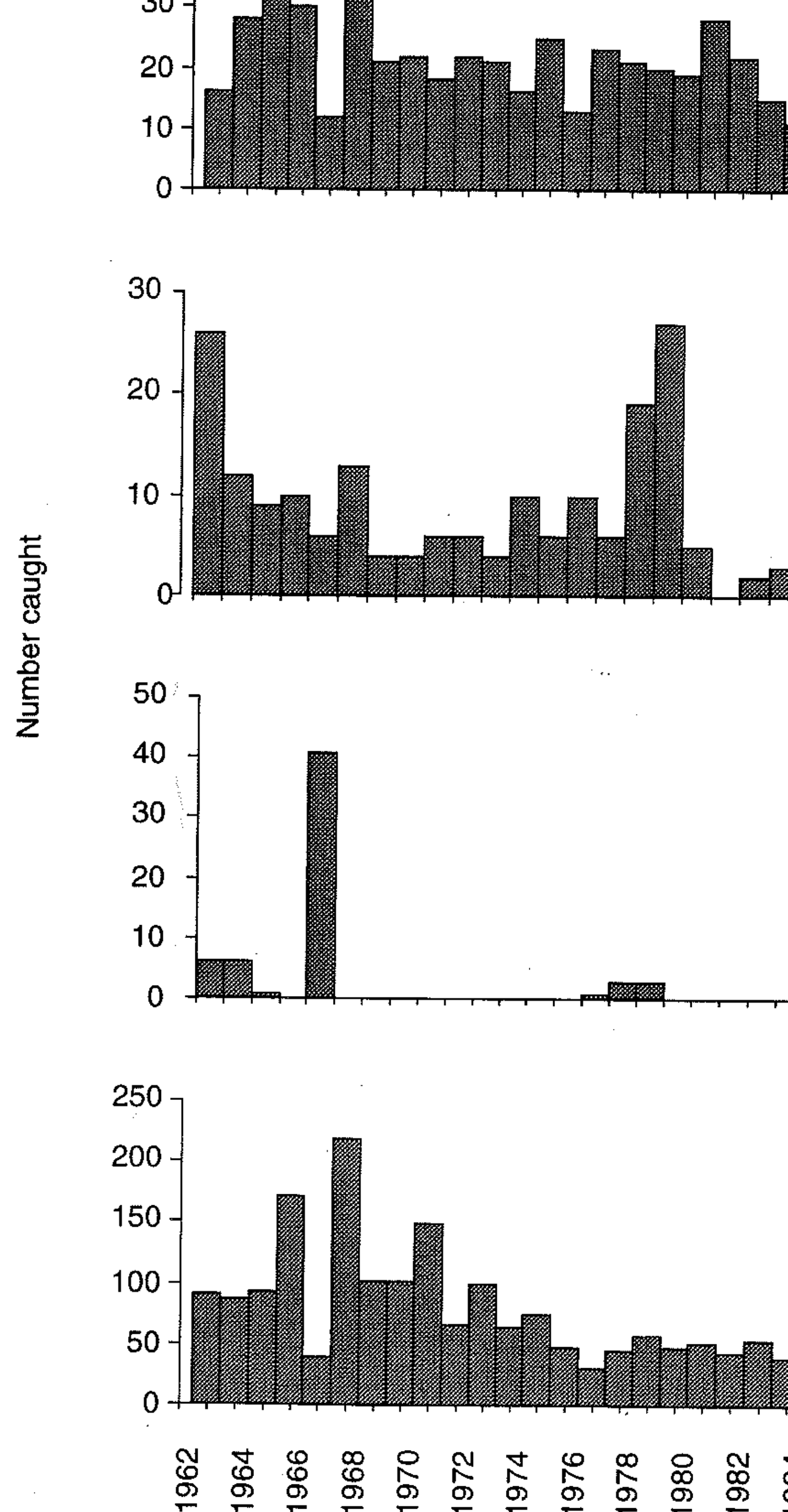

Hammerhead
White
Tiger
1952
1954
1956
1958
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1993
Year

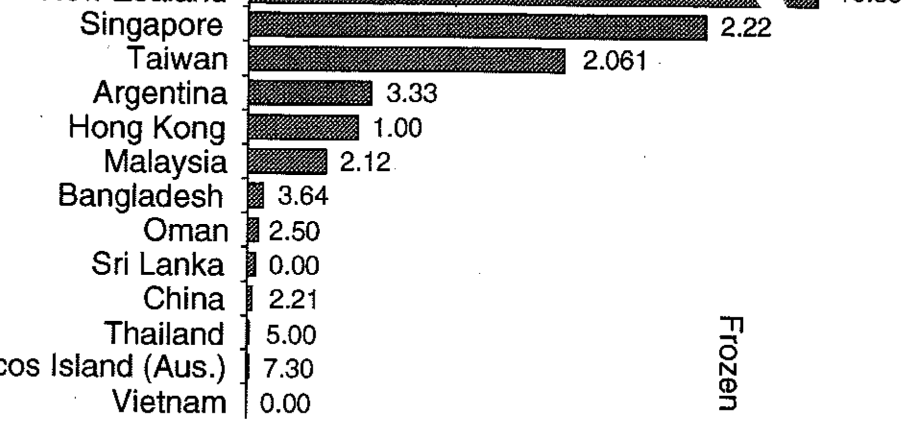

Number caught
0
25
50
75
20
40
60
80
10
30
1952
1954
1956
1958
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
Year

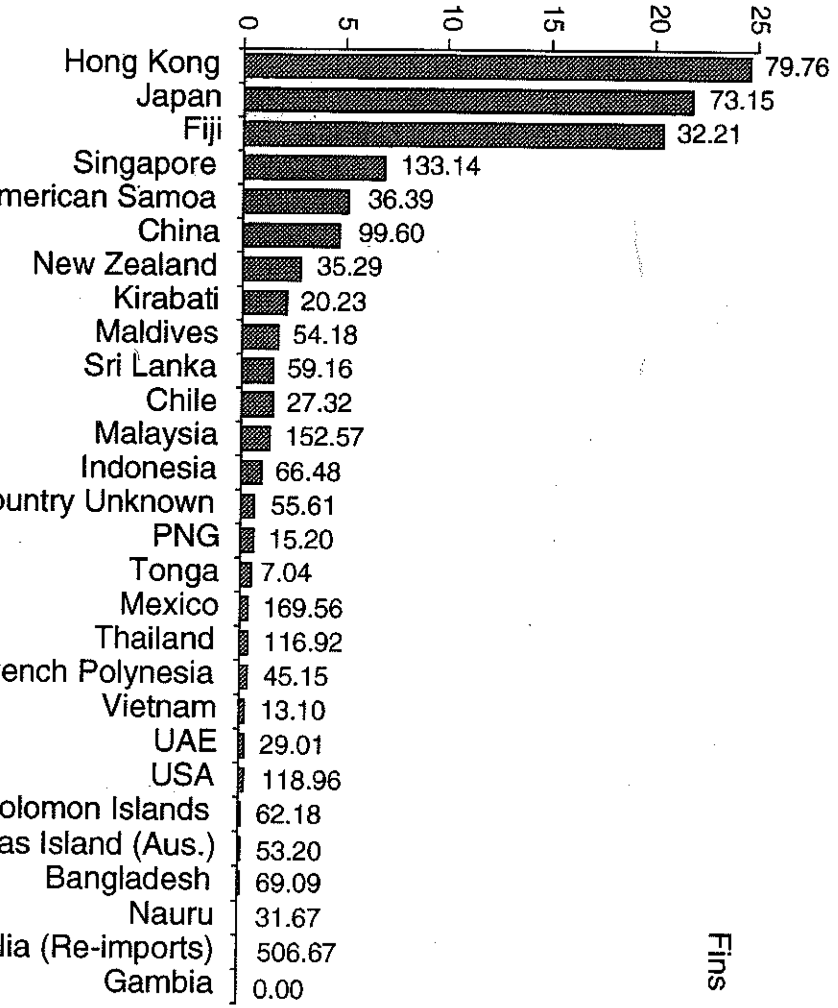

Angel
White
Tiger
Grey Nurse
Port Jackson
Other


Number caught
Sharks < 2m
Sharks ≥ 2m
Year


Blacktip Whaler
Other Whalers
Tiger
962
964
966
968
970
972
974
976
978
980
982
984
986
988
990

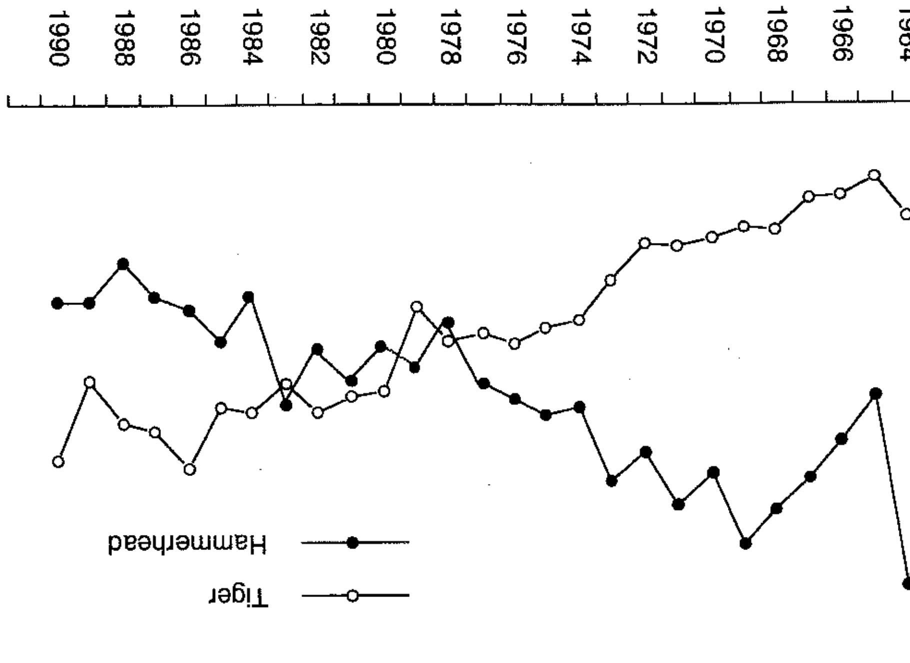

Number caught
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982





Co

anges in the proportions of tiger and hammerhead sharks
of the Queensland Shark Control Program 1962/63 - 1990/91



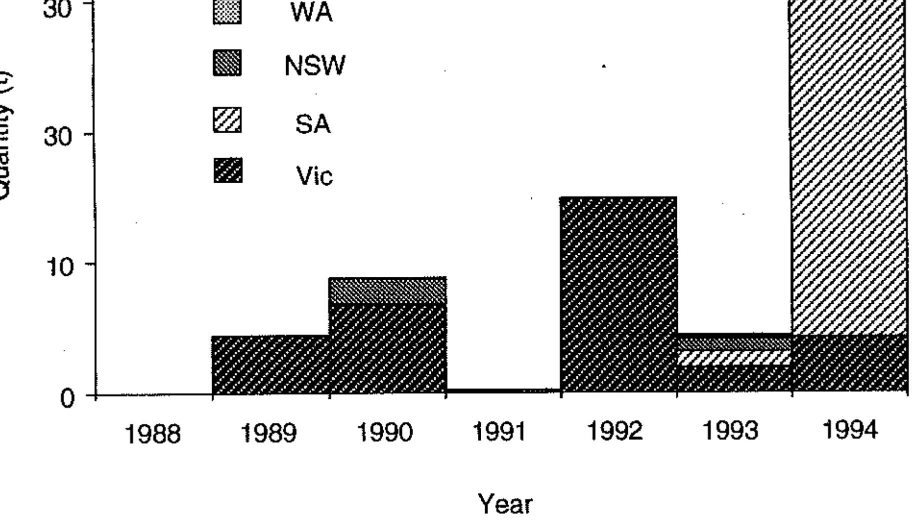
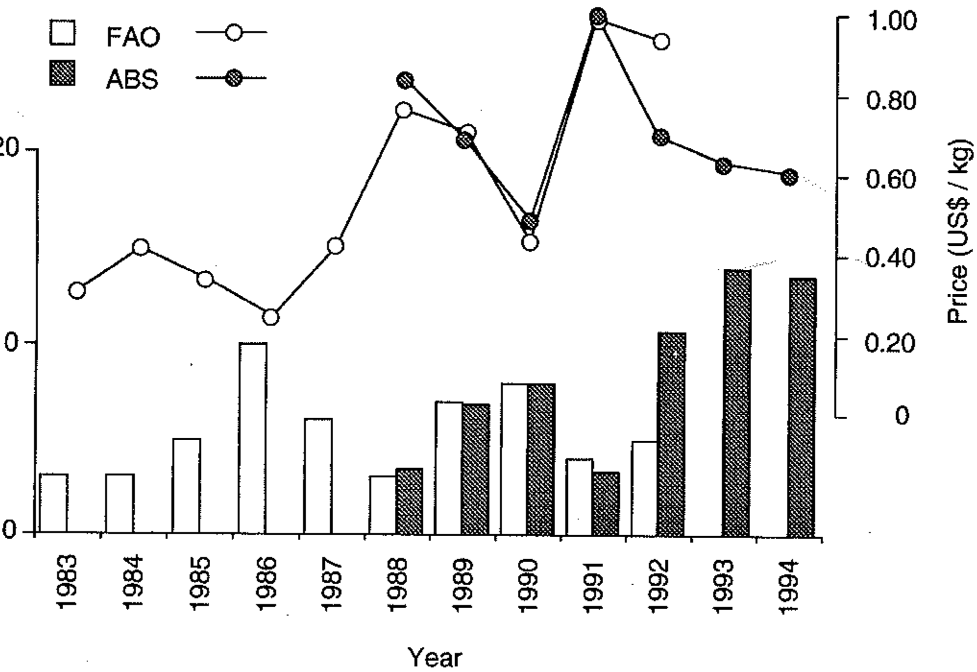
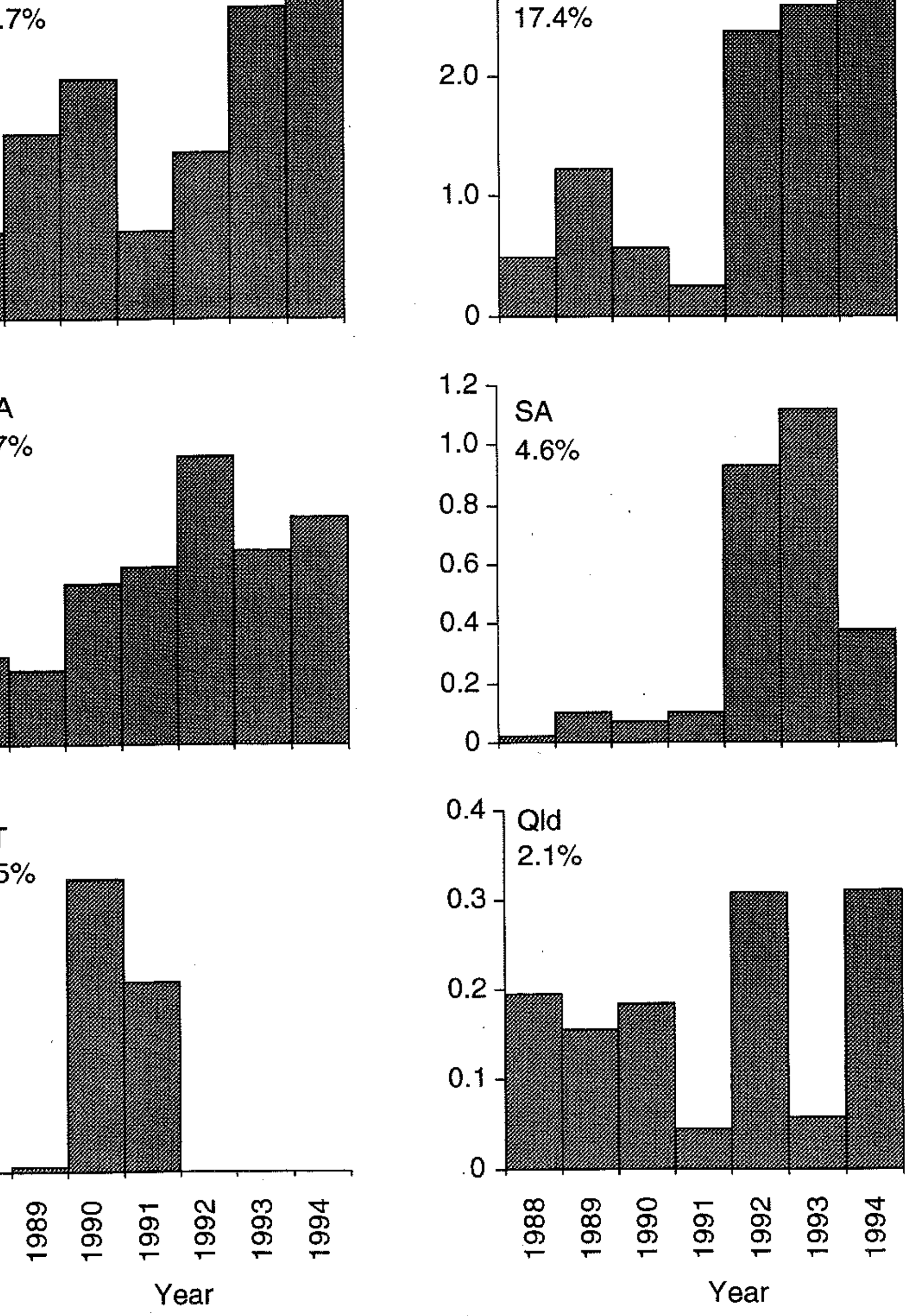


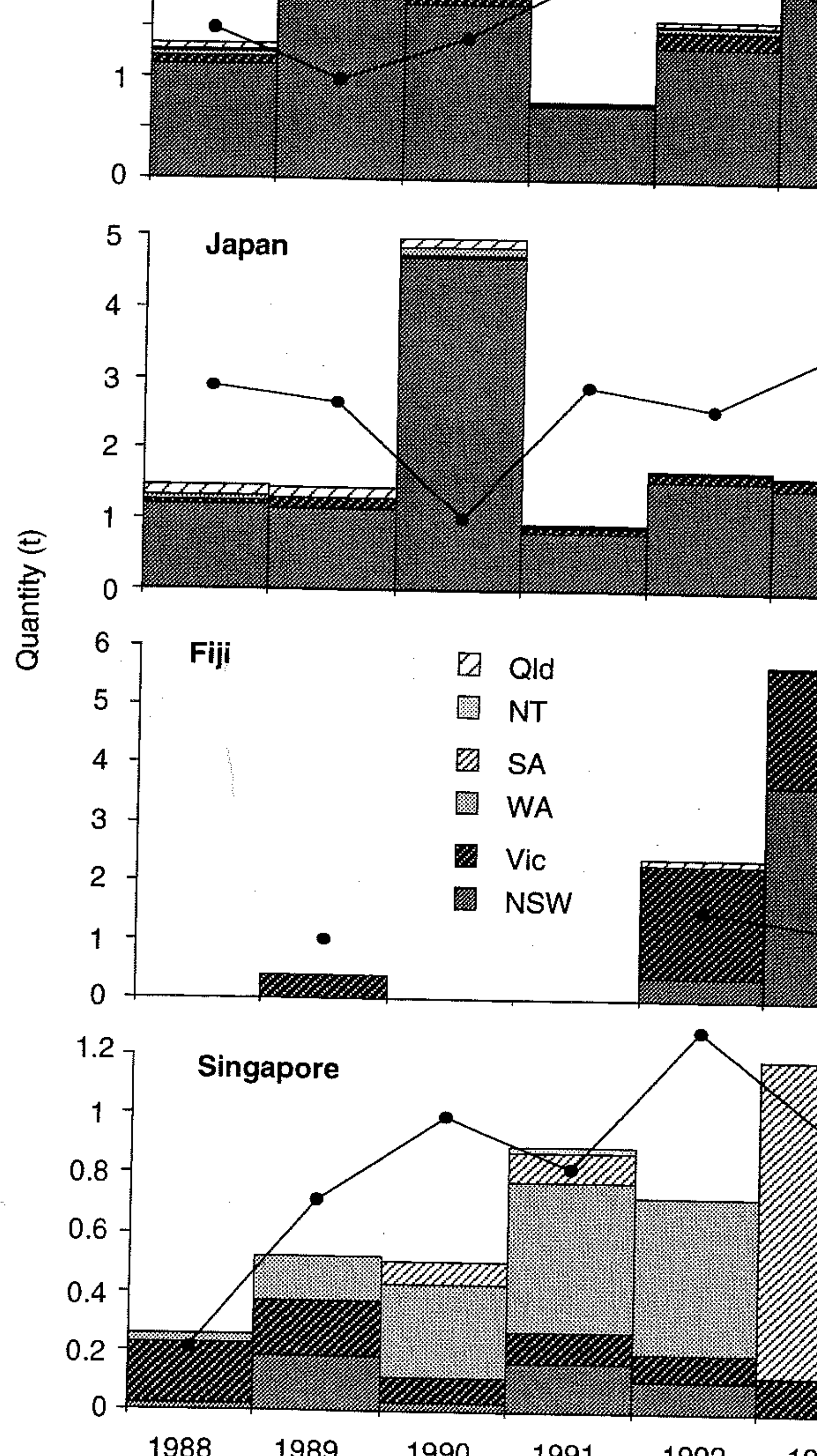
Figure 32. Quantity of frozen shark imports from New Zealand to each Australian state (Data from the Australian Bureau of Statistics, *in litt.* 1995).



Changes in the average price and quantity of dried shark fins imported into lia (Data from FAO 1995 and Australian Bureau of Statistics, *in litt.* 1995).



4. Changes in the quantity of dried shark fins imported into each Australian



Elizabeth Hayes

Overview and Background

ffshore islands are surrounded by an Exclusive Economic Zone (EEZ) of over 1.2 million extending from latitudes 25 to 550 South (Figure 1). The relatively narrow shelf around favour the rich planktonic ecosystems commonly found over the large offshore banks of the and consequently, although deepwater fisheries are quite productive, the coastal fisheries are yan fisheries are moderately important for New Zealand with catches making up 2.19% of ction during the last 5 years. This is small on a global scale, with New Zealand contribut- rld chondrichthyan production compared to Indonesia, which has the largest y in the world, supplying 10.18% of the world catch (Bonfil 1994).

d since pre-European times when Maoris made extensive use of school shark for food, oil 5). Commercial shark fishing in New Zealand dates back to the early 1900s but was proba- the 1940s, with small landings only from bycatch of other fisheries (NIWA Fisheries, nitial catches were based on longlining school sharks, particularly the pregnant females allow water in spring (Palmer 1994). Around 1940, an increased wave of effort in shark arks were harvested for the vitamin A rich oil from their livers. School shark and dogfish for this purpose, the carcases were generally dumped. The fishery developed rapidly to a tric tonnes (mt) per year, then collapsed in the mid 1950s with the development of synthet- emand for shark fillets in Australia saw another increase in shark fisheries and in 1971 some 5) of school shark (*Galeorhinus galeus*), rig (*Mustelus lenticulatus*) and elephant fish ere landed with 600 mt of this exported to Australia as fillets. In 1972, the mercury lesh was analysed and high levels led to a decline of this market.

rk fisheries continued to expand. Landings from the rig fishery increased greatly in the ase in value of the species saw new fishers entering the fishery. Catches fluctuated between year from 1976 to 1985. Similarly school shark catches increased dramatically in the late species declined and the use of set nets facilitated their capture. Elephantfish catches in 1936 to 1 400 in 1971. In 1986 after serious declines in the fisheries had occurred, New dividual Transferable Quotas (ITQs) for its most important species. The total quotas were al catch levels for school shark, rig and elephantfish to promote stock rebuilding (Francis

shark fisheries is that landings are not representative of removals from the sea. A large aken as incidental catch from longlining operations and trawl fisheries, and although some incidental catch, they are known to be incomplete and often biased, hence no reliable .

f New Zealand Chondricthyan fauna

t 95 species of chondrichthyan fishes including approximately 65 species of shark, 20 ocephalans (*chimaeras*) (Paulin et al. 1989). Target fisheries operate predominantly in

(*Carcharhinus brachyurus*) and tiger shark (*Galeocerdo cuvieri*) are widespread spe the world.

A general description of the shark species found in New Zealand waters is given exhaustive, but aims to give a general idea of the species present. The informatio Paul (1986) and Paul (1993). Species which are of commercial importance are

Primitive sharks

This group is named as such due to the primitive nature of its anatomy. It is rep Zealand. Heterodontidae (Horn sharks), Chlamydoselachidae (frill sharks) and horn shark is represented by a single specimen only and the frill and cow sharks

Galeoid sharks

The galeoid group is a collection of families sharing similar anatomical features. representatives in New Zealand waters, most are pelagic species, some however, a waters. The families include: Lamnidae; Carcharinidae; Cetorhinidae; Alopidae; Scyliorhinidae and Triakidae. The family Lamnidae is represented by three speci *oxyrinchus*), white shark (*Carcharodon carcharias*) and the porbeagle shark (*Lamna* ly contains three species in New Zealand waters, these are the tiger shark (*Galeo* (*Prionace glauca*) and the bronze whaler (*Carcharhinus brachyurus*). The only spe the basking shark (*Cetorhinus maximus*). This species occurs sporadically around ally be taken incidentally by trawls and in set nets.

The thresher shark (*Alopias vulpinus*) from the family Alopiidae occurs around the South Island. These sharks are sometimes trawled, netted or line caught and are r

From the family Sphyrnidae, the smooth hammerhead shark (*Sphyrna zygaena*) is northern New Zealand and is sought after by big game fishers. The family Odont species, the sand shark, (*Odontaspis herbsti*) which is occasionally caught in the ea Members of the family Scyliorhinidae (Catsharks) differ anatomically from the sh well as being generally smaller, bottom dwelling and harmless. There are several Zealand, most are found in deepwater.

The last family (Triakidar) or smooth dogfishes contains two species of commerci the school shark (*Galeorhinus galeus*) and the rig or spotted dogfish (*Mustelus lenti*

Squaloid sharks

The squaloid group of sharks are distinguishable by the absence of an anal fin. T (spiny dogfishes), Dalatiidae (spineless dogfishes), and Echinorhinidae (bramble s the family Squalidae of which 30 are found in the New Zealand EEZ. The southe *acanthias*) is the most common, numerous less common species are found in deep w

Chimaeras

The Chimaeras are a group related to sharks with cartilaginous skeletons but havi gills opening through only one slit on each side. There are three families, all of w

non species of skate in New Zealands coastal waters, the rough skate *(Raja nasuta)* and smooth
ta). Several species are found in deep water, the most common is the deepwater skate

s are of commercial importance in New Zealand and are therefore described in more detail.

aleorhinus galeus) is found throughout the coastal waters of New Zealand and is most
h, this species is also widespread around southern Australia, in temperate waters of the east-
western South Atlantic, the North and South Pacific and off South Africa (Last and Stevens
y a shallow shelf species but occurs to at least 600 m. Female school shark are commonly
ing and summer when they migrate into shallow water to give birth. The pups live inshore
e or two years, where they school by size, they subsequently disperse across the shelf. School
ought to have a coastal to middle shelf distribution but is capable of substantial migrations as
apture of 11 school sharks in Australia which had been tagged in New Zealand (Paul 1992).
not been determined for the New Zealand shark but Australian studies have found it to be
growing, tagging studies suggesting a maximum age of at least 50 years (Annala 1995). Age
estimated at 10 to 12 years (110-115 cm total length) for males and 15 years or more (120-
) for females. Breeding is not annual and most work on the species suggests that females may
le with a one-year gestation period. Fecundity is low and size dependant, females bear live
10 pups in small females to over 40 in the largest (Annala 1995).

nticulatus), is common in shelf waters around New Zealand and found down to depths of
losely related to the southern Australian gummy shark and Mustelus species elsewhere.
(1992) found age at maturity for the Hauraki Gulf stock to be 3.7 and 4.7 years for males and
however, growth and age at maturity have been found to vary regionally. This corresponds
75 to 110 cm (total length). The maximum length for rig is 151 cm for females and 125 cm
ugh the maximum age attained in not known they live for at least 13 years (Francis 1992).
1988) noted that rig migrate and segregate by sex and also possibly by size and maturity.
shallow coastal waters during spring and summer for pupping, following a 10 to 11 month
hey produce live young and breed every year. The number of young produced increases with
e, ranging from 2 to 24. Pups are born at a length of approximately 30 cm (Francis and
ow rapidly during the summer then disappear along with the adults in autumn, presumably to
Tagging studies around the South Island have indicated that rig (especially females) are
xtensive coastal migrations, with more than half the recaptured females having travelled
(Francis 1988).

hinchus milii) are most common from Kaikoura south, and are rare north of the Cook Strait.

Spiny dogfish

Spiny dogfishes are the most abundant sharks off the continental shelf (King an
species of spiny dogfish in New Zealand, the southern spiny dogfish *(Squalus aca*
Large quantities of the southern spiny dogfish are caught off the east and south
depths of 100 - 700 m (Bryant 1979). They move in large schools migrating nor
tal shelf with the seasons, they are also found on the Chatham Rise and Campb
70 to 100 cm in length and 3-4 kg in weight, they rarely exceed 1.5 m (Palmer
young with a litter size of 2 to 8 pups. The pups are born at a size of about 20 c
gestation period. Their growth is slow with males maturing at about 11 years an
least 30 years of age (Palmer 1994).

2 Current Fisheries

2.1 Subsistence

Little information is available on the current level of subsistence fishing in New
Act 1983 requires that in setting a total allowable catch (TAC), allowance must
recreational and other non commercial interests in the fishery.

Maori fishers traditionally caught large numbers of spiny dogfish (koinga or okeo
early this century. Rig was probably an important species and is still caught in s
of the North Island, especially the harbours of the Auckland region, however, th
pared to commercial catches (McKoy 1988). Perhaps the most important food sh
shark (kapeta) caught mainly around the upper North Island. The flesh was drie
oil used in cosmetics, traditional ceremonies and (mixed with pigments) in paint
From the quantity reported caught it is clear that school shark must have been a
likely to have been traded with inland tribes (Paul 1988). The extent of curren
unknown (McKoy 1988). There is no information on the significance of elepha
(McCoy 1988 & Annala 1995).

The treaty of Waitangi (Fisheries claims) settlement Act 1992, provides for the s
cial fishing claims, and for the drafting of regulations covering customary and tra
regulations under the act recognise and provide for customary food gathering by
special relationship between Maori and places of importance for customary food
reserves (Ashton 1993).

It is possible for exclusive Maori fishing reserves to be created by notice in the G
recommendation of the Maori land court under section 439 of the Maori affairs a
tinued by section 338 of the Te Ture Whenua Maori Act 1993 which repealed th
Economic Review 1993). Whether sharks are included in current negotiations c
unknown.

g in New Zealand waters is regulated under the Fisheries Act 1996, which has just replaced the dministered by the Ministry of Agriculture and Fisheries (MAF). A Quota Management s introduced in 1986 to conserve the major fisheries. Prior to the introduction of the QMS, aged by a range of input controls including restrictions on seasons, methods, gear and area, and mbers (Clement 1993). Today there are 32 species, or groups of species, managed as 181 sepa- der the QMS. The New Zealand EEZ is divided up into ten Fisheries Management Areas ock is defined by a quota management area (QMA) which may be the same as an FMA or may ng of several FMAs. There are three directed coastal fisheries for shark in New Zealand, all of d under the QMS with a Total Allowable Commercial Catch (TACC) set each year. The up each year and distributed to license holders as Individual Transferable Quota (ITQ). The heries are for school shark, rig and elephantfish (Table 1) (See Figures 2, 3 and 4 for QMAs for anaged species). Some species have catch limits imposed each year but are not part of the ITQ de spiny dogfish and skate. The deepwater fisheries came under New Zealand management eclaration of the EEZ in 1978 and were subsequently integrated into the QMS (Clement 1994).

isheries may vary the TACC each fishing year taking into account the annual review of the economic considerations and any non-commercial interests in the fishery.

rected fisheries

ion outlines the current and historical catches and management of the three quota managed able caution must be used in interpreting historical landings of shark as under reporting and ommon in early catch records. There was a change in reported landings from calender year to ber 1 to September 30) in 1983 for elephantfish and school shark, and in 1985 for rig. The used for management purposes are referred to by the abbreviated names used in Clement 1994, O and ELE for school shark, rig and elephantfish respectively (See figures 2, 3 and 4 for man- ndaries).

is section was taken from Paul 1988 & Annala 1995.

upported a variety of fisheries around New Zealand from the early 1940s. Recorded landings re misleading until at least 1955. Initially this fishery was for liver oil with most of the carcases sea. From the mid 1950s, school shark was caught and landed mainly for food and from the late 1970s between 300 and 500 mt was landed annually. During this time some line vessels were for the 'fish and chip' trade and for export to Australia. Traditionally the school shark fishery ongline fishery, however, target set netting became important in the late 1970s and the catch Figure 5). Catch increases at this time may also be attributed to a decline in other coastal e mid 1980s, set netting was the main fishing method providing just over half the total catch, ird and trawling the remainder, this however, varied regionally. The total catch peaked at 4941 s followed by a small drop in 1984/85 and further decreased after the introduction of quotas in species rated sixth in terms of landed weight in the domestic fishery (Paul 1988). During the

in landings reflect this with landings peaking in the December to February pe ing of school sharks inshore in the summer months, but may also be due to a g Movement of tagged fish suggest that there is a single biological stock. Howev rate fishstocks (see Figure 2), essentially to prevent localized depletion (Annal

The TACC for the 1994/95 year was 3092 mt with 2584 mt actually being cau TACCs and recent catch levels are sustainable or are at levels that will allow t that will support the maximum sustainable yield (MSY). Estimates of current

The movement of school sharks between Australia and New Zealand has implicatio

Rig

Information for this section was taken from Francis & Smith 1988, Massey 19

History

Landings of rig (*Mustelus lenticulatus*) have been recorded since 1946 but explo Initially, most of the catch was taken by trawler (80% in the 1960s). Market d mid 1970s then landings increased significantly due to increased demand and t nylon (which has a much greater catching capacity than the previously used co about 3200 mt per year during the late 1970s. Landing data must be interprete under reporting of catch and catch dumping especially during the early 1970s v There was an increase in effort during the 1970s as the value of rig increased a Many trawlers were converted to set netting and set nets accounted for 80% of 1970 and 1978 the total catch of rig in New Zealand increased from 930 to 33 east coast South Island rig stock was in a seriously depleted state. Catch rates v overfishing and landings were about four times the estimated sustainable yield

In 1984 part time fishers (those earning less than NZ$10 000 from fish sales /ye . With the introduction of ITQs in 1986, quota was allocated to fishers who h between 1983 and 1985. An annual rig quota for the whole fishery was set at 1 landings of the previous decade. A TACC of 330mtwas set for the east coast S was a 71% reduction in catch from the 1984-85 year. The large catch reductio with very low rig quotas and many tendered their quota back to the governme

The Fishery

Rig are fished throughout New Zealand waters, with most of the catch taken f m around the south west North Island, eastern and southern South Island and harbours. In 1988 more than 75% of the catch was taken by set net, the remai The most important set net fisheries are at Ninety Mile Beach, Kaipara Harbou Harvour, South Taranaki Bight- Tasman Vaym Kaikoura, Canterbury Bight and during spring and summer when rig aggregate in shallow coastal waters. Five bi northeast coast North Island (NECNI); southeast coast North Island (SECNI); west coast South Island (WCSI); west coast North Island (WCNI). Fishstocks spond closely with SECNI, ECSI AND WCSI biological stocks respectively, wh the WCNI stock and SPO 1 consists of part of WCNI and all of NECNI stocks

New Zealand rig fisheries have been made which study CPUE and catch composition. Data on
was obtained from monthly returns from fishers, MAF fisheries statistics and from King (1985,
et al. (1987). The results of this analysis showed a decline in CPUE in all fishstocks except
and Smith 1988). CPUE provides an estimate of the abundance of the catchable stock of rig in
however, the analysis involves assumptions, biases in the CPUE indices mean the true decline
greater than those shown.

the CPUE in the south Island rig stocks prior to the introduction of quotas in 1986 indicated
not sustainable. The introduction of the QMS in 1986 decreased the landings of rig by more
f the previous decade. However, since 1986-87 landings have generally increased in response to
except in SPO 10 which has recorded zero landings since the inception of quotas. In SPO 3
ave fallen short of TACC for several years which may be due to the concentration of the fishing
ea or a local depletion of the stock. TACCs were increased for all fishstocks except SPO 10 by
-92 fishing year. These increases in TACCs and changes in the conversion factors meant a 37%
lowable commercial removals from all main rig stocks between 1991 and 1993 (Francis 1995).
shing year the TACC for the total fishery was 2097 mt and had remained fairly constant for

onstant yield (MCY) has been estimated as 610 mt for the WCNI stock and 290mtfor the
CY cannot be estimated precisely for the SECNI stock but based on catch history before the
e QMS, is likely to be less than 70 mt (Francis 1995).

his section was taken from Annala 1995 and McClatchie and Lester 1994.

lorhinchus milli) have been fished commercially since the beginning of this century and landings
ed since 1936 (Figure 7). Historically the foreign catch may have been significant as foreign
h close inshore in the Canterbury Bight, however, now virtually all the catch is taken by New
vessels. Prior to the 1950s these fish were considered worthless and regarded as bycatch, later in
egan to be targeted directly as a market was found for the flesh in the 'fish and chip' trade and
mand for their oil. Most of the catch came from Canterbury bight but commercial quantities
in Wellington South. From 1936 to 1949 landings were consistently low (< 400 mt/year), then
ly to 1238 mt in 1958. Catches fluctuated after this reaching a peak of 1401 mt in 1971 then
ed to about 600mtin 1981 where the catch remains steady today. When the TACC was
86 it was set at 470 mt and exceeded by 24 %. The TACC was slowly increased to 639 mt in

de reported landings have been between 500 and 700 mt per year. The greatest catches came
the landings have exceeded the TACC since the introduction of the quota management
he quota for ELE 3 was set at 280 mt as this stock was considered overfished, however in 1986-
he TACC was exceeded by about 80%. The TACC was increased in ELE 3 in 1988-89
ce then landings have exceeded TACC by only small amounts.

sonal, generally operating over spring and summer in inshore waters, however the season has a

are not available, yield estimates for ELE 3, 5 and 7 have been made and have
mt. It is not known if the current catch levels or TACCs are sustainable. The
constant in ELE 5 and 7 since its introduction and catches and TACCs in ELE
of the catch is from ELE 3 where catches continue to overrun the TACC. Th
ELE 3 to 500 mt for the 1995-96 season on the advice that this would be susta
icant changes in landings (Memorandum from the Minister Nov. 1995).

Other non ITQ species

Information for this section was taken from Clement 1996.

In the south east area FMAs 3, 4, and 5 & 6 there are a number of non ITQ sp
director general of the ministry of Agriculture and Fisheries under regulations.
ing permits to target these species are allowed to take these species on a compe
the year is reached. In 1994-95 these limits were applied to spiny dogfish and s
way: skates and rays (FMA 3) 900 mt; spiny dogfish (FMA 3) 4 075 mt and spi
Past biomass surveys have been used to calculate the maximum regional catch
recorded catch of the main non-ITQ species from 1986 to 1994 is presented in

2.2.1.2 Bycatch

About 40% of the total catch of sharks is bycatch of trawl fisheries (Bonfil 199
not allow fishers to target species without regard to other species they might ta
a legal obligation for fishers to have access to quota to cover the bycatch of any
the Minister of Fisheries Nov 95). In the event that a fisher over catches their
for an amount of uncaught target quota under the bycatch trade off agreement

Many New Zealand fisheries have shark bycatch, some of which is utilised and
nificant bycatch of bottom trawls (Palmer 1994). Some large fisheries eg. orang
and hoki *(Macruronus novaezelandiae)* have a small and poorly recorded percent
be cumulatively significant. School shark is an important bycatch of the jack m
barracouta *(Thyrsites atun)* trawl fisheries, as well as other trawl, set net and lin
(Palmer 1994). The dark ghost shark *(Hydrolagus novazelandiae)* is caught in m
barracouta *(Thyrsites atun)*, hoki *(Macruronus novaezelandiae)* and silver whareh
and an increasing quantity of skate is also taken incidentally (Figure 9). Sharks
domestic tuna fishery, with catch rates as high as 21 sharks per 1000 hooks for b
tuna longline fishery targeting bigeye tuna *(Thunnus obesus)* in the New Zealan
and 1994 (Table 5).

All commercial fishers in New Zealand are required to fill in a catch, effort and
details the trip time, catch, effort, landing date and point of landing. The top
only the top 5 species caught with corresponding area and effort data, and there
The bottom panel records the landed weight for all species but without good are
constitute a minor bycatch in many fishing operations, extracting meaningful da

Chondrichthyan landings from the New Zealand EEZ (excluding foreign longli

70s a variety of foreign fleets trawled and longlined in New Zealand waters ...
antly under reported. Catch data for the Soviet fleet are not available, but the Japanese fleet WCNI and ECSI zones from 1967 onwards. Catches peaked in 1977 just prior to the decla- ealand EEZ in 1978. The Japanese fleet recorded landings of 1628mt of sharks and rays in are specified (Paul and Robertson 1979, cited by Francis and Smith 1988).

fleet has now practically disappeared from New Zealand waters, only forming a presence in ZFIB Economic Review 1991), where sharks are taken as bycatch. However, while some ele- fleet disappeared, much of it remained as the charter fleet and was similarly replaced by large ffshore fishing therefore continued at a similar level. In the 1992/93 fishing year there were r southern bluefin tuna (*Thunnus maccoyii*) and 7 for the northern tuna fishery, these were all se. This fishery is believed to fin and discard sharks at sea and under-report catches, however, s made between observer carrying vessels and the total fleet the extent of this will be isheries, unpublished data). A bycatch of school sharks is taken, which is thought to be e quantified. A substantial catch of large pelagic sharks is taken, particularly blue shark mako shark (*Isurus oxyrinchus*) (Tables 3,4 & 5).

eign vessels operating on behalf of New Zealand companies) record catches of the three quota well as ghost shark, spiny dogfish and skate. In the 1993 calender year, catches for these shark 719.4 mt; spiny dogfish 2 332 mt and skate 636.7 mt, worth US$0.25 m, US$2.84 m pectively (NZFIB Economic Review 1993).

al

of information on recreational fishing in New Zealand, however, several species of shark are by recreational anglers and game fishers. Sharks are probably rarely targeted in coastal line ng the occasional shark fishing tournaments, but more often taken as bycatch. Recreational e carried out by MAF Fisheries in 1991-92 and 1992-93 in southern and central regions, and d some estimates of the extent of recreational catches.

and effort surveys in 1991-92 estimated the catch of rig from SPO 3 as 23 mt or 6.5% of the rom SPO 3 in the same year (Annala 1994). The survey in 1992-93 in central New Zealand h of rig from the quota management areas SPO 2, 7 and 8 as 11 t, 18mtand 38 mt respectively, 5% respectively of the commercial catch (Annala 1995). Recreational landings from these e small compared to the commercial catch (Francis 1995). Rig are caught in set nets by recre- ughout New Zealand but the catch is relatively minor (Francis 1995). Recreational landings e declined during the 1980s as stock sizes declined and as commercial fishers progressively n the coast intercepting the schools of aggregating rig (Francis 1988). Less than 3% of the gged around the South Island and southern North Island in 1982 to 1984 were recaptured by s.

versally sought by recreational fishers, school shark are regularly caught and some are undoubt- ere are periodic shark fishing contests by fishing clubs where school shark (along with rig and a major catch component. School shark are a recognised gamefish and there appears to be in seeking record light tackle catches, however, attitudes vary regionally (Paul 1988). A sur- during the 1991-92 fishery year, 27 mt or 12 % of the commercial catch of school shark was onal anglers in QMA 3, and 3 mt or 0.5% of commercial catch in QMA 5, ranking it about ... These surveys in the central

Elephant fish do not appear to be an important species for recreational users at th are considered to be good sport. Elephantfish used to be frequently caught in surf Canterbury, with as many as a dozen being landed in a day, however, this is no lo one or two is considered unusual (McClatchie and Lester 1994). Elephantfish we nor were they recorded as being caught in recreational fish surveys carried out in t in 1991-92 or central region in 1992-93 (Annala 1995).

A recreational fishery for gamefish has existed off northeastern New Zealand since local tourist industry and mainly operates between December and April (Saul and ciple target species is striped marlin (*Tetrapturus audax*) but sharks are both targete more recently established fishing grounds on the northeast coast of the North Isla bay and off Otago on the east coast of the south Island, Mako shark and Blue shar are also targeted off Port Taranaki on the North Island west coast. Trolling and c are the predominant methods and chum is often used with the latter. Annual rec the New Zealand Big Game Fishing Council have been kept since 1978 (Table 6)

With the inception of the multi-species gamefish tagging program in New Zealand ing was introduced. Catch records were kept for: blue shark; mako shark; school s category including: bronze whaler, hammerhead, oceanic whitetip, sevengill and t and 1990, 2819 mako sharks had been tagged and released (Figure 10) with 86 re accounted for 66% of mako recaptures. In the same period, 532 blue sharks, 55 sc sharks were tagged and released with 3, 9 and 3 recaptures respectively (Saul and

Limits on recreational fishing are set by the Fisheries (Amateur Fishing) regulatio enforce a daily bag limit of 20 fish from a list of preferred species which includes s fish. Gear restrictions relevant to sharks include a minimum mesh size of 150 mm

2.4 Beach meshing

There is no beach meshing carried out in New Zealand waters.

2.5 Other non lethal uses of shark

There is a small amount of collecting for aquarium display. Kelly Tarlton's Underv shark display which includes rig, school and sevengill sharks collected from Manu

3 Trade

3.1 Domestic

Shark intended for the domestic market is sold through wholesale or processing co an agency system (Massey 1989). Most of the rig is sold to fast food outlets for 'fish where it is commonly sold as 'lemonfish'. School shark is now commonly used sin increasing catches of spiny dogfish, this species is now used in the fish and chip tr

g year (landings) is compared to the 1993 calender year (exports) to examine any trends in
ption. From this it can be seen that from 1990 to 1995 about 20 % of the rig landings have
l this remains fairly constant, whereas, only between 0.3 and 6 % of the landings of
been exported between 1991 and 1995 (Table 7).

nal

xport

ducts from New Zealand is recorded by the New Zealand Department of Customs. This data is the New Zealand Department of Statistics where it is purchased in summary form by the New ndustry Board (NZFIB) to be compiled for the annual economic review. Data on selected d since 1988, prior to this, exported shark product was contained within the general category are recorded in the following categories: elephantfish, ghost shark, school shark, skate, spiny ark- other.

volume of seafood exports from New Zealand was 305 826 mt with a total value of US$0.649 conomic Review 1993). However, a large percentage of New Zealand export earnings is made alue species. The five top export earning species accounted for 51% of the export volume and value. Chondrichthyan species accounted for 1.3% of the total volume and 0.66% of the ood exports. Figure 11 illustrates the increase in quantity and value of chondrichthyan exports .

made between shark products in these export statistics, as the categories are listed by species that they refer only to meat. The New Zealand seafood exporters directory lists companies st themselves as exporters of shark fin, shark liver oil and shark cartilage powder, however, no y the NZFIB regarding exports of these products.

ich the abovementioned categories of shark are recorded has seen a great diversification in the New Zealand from 8 countries in 1988 to 30 countries in 1994. The main export markets for ince 1988 are: The Republic of Korea, Australia and Japan, with smaller markets in France, the e 12). In 1995, The Republic of Korea was New Zealand's top export market, importing over t including 1771 mt of spiny dogfish and 88.8 mt of ghost shark.

Australia consist mainly of school shark and rig (with a substantial amount of product from the gory), the Republic of The Republic of Korea is the major market for spiny dogfish and Japan ost shark. Skate has represented the majority of product exported to France over the previous 8 d markets in Japan, Italy, the Republic of The Republic of Korea and the US in recent years.

rising trend in exports since 1988 for all categories except elephantfish which has decreased 13). Shark exports fell in 1993 (except skate) in line with the general trend in seafood the result of unfavourable market conditions and an increase in the New Zealand exchange rate Review 1993).

orded exports of spiny dogfish in 1988, however, in 1989 this species constituted 59% of total ues to be the top chondrichthyan export species by weight (Figure 14). The second most abun- ory has been the shark other category since 1992. Elephantfish has been the smallest export since 1990.

3.2.2 Destinations of landings

3.2.2.1 Fins

The value of shark fins depends on the size of the fin and species of shark, larg labour involved in processing. The value is dependant on the amount of fibre the fin, generally the less fibre it has. The fins from abundantly caught sharks phants and ghost sharks are therefore, not of very high value (Anon 1991).

Shark fins were first exported from New Zealand in the 1960s when the fins were g exported to Hong Kong as fish fertilizer (Anon 1991). The directory of New Zealan States lists 2 companies as currently exporting shark fin. It appears that most produc where it is exported to Asia and South America (Talaford Sea Products pers. comm

Recorded landings of shark fins from the New Zealand EEZ increased from 0.9 3.2mtin 90-91 to 3.5mtin 91-92, however, this is probably an underestimate (N

Export figures for shark fins are not recorded separately from other product by (T. Maddock pers comm.). However, some figures have been obtained from im Hong Kong is the largest importer of shark fin in the world (Sth China Morni Hong Kong were obtained from trade statistics publications. In 1995 Hong Ko fin imported from New Zealand worth US$256 205 and 44680 kg of 'salted or US$253 490. Table 8 shows the available statistics for Hong Kong for 1980 t

3.2.2.2 Liver oil

In the 1940s New Zealand was a net exporter of shark liver oil, the majority of school shark. The oil was used extensively for the productin of vitamin A unt thetically (Summers and Wong 1992). Domestic trade in shark oil from the de the declaration of the EEZ in 1978. In 1985, 23 mt of shark liver oil was expor were exported from July to December 1986 (Summers 1987). Japan is the prin it is used principally for the manusfacture of cosmetic products (Summers and W

Small quantities of livers from deep water squaloid sharks are currently utilized (Bonfil 1994). However, the commonly caught southern spiny dogfish has a l The New Zealand seafood exporters directory lists 2 companies exporting liver

3.2.2.3 Cartilage

The New Zealand seafood exporters directory lists 2 companies exporting shark ever no figures were able to be obtained for this product.

3.2.3 Import

processing and is then imported back into New Zealand.

se in the amount of product imported in 1995, the majority coming from Japan (72 mt in vith about 4 mt coming from each of China and Taiwan (Table 9). There is no record of fins ct being imported.

ns and Recommendations

ved that the ability of fish species to maintain stable populations in the face of environmen- uman exploitation is related to fecundity. Sharks in particular are vulnerable to overfishing slow growing, late maturing, have low fecundity and a long gestation period. Caution needs tting limits to shark fishing, as has been demonstrated elsewhere in the world, high initial always proved unsustainable due to the tendency for shark stocks to have a low natural pro- of collapsed shark fisheries from around the world warn that a precautionary approach needs ging shark fisheries.

of shark and a decrease in availability of other fish species saw huge increases in catches of ricthyans in the 1970s and 1980s. Elephantfish catches reached a peak in 1971 then dropped nilarly, school shark and rig experienced similar peaks in the early 1980s followed by steep unit effort data indicated that rig populations had been reduced to below one-third of their l areas (Francis and Smith 1988).

alian fishery for gummy shark (*Mustelus antarticus*) is the only other Mustelus fishery for re available. Between 1974 and 1983 CPUE declined to 42% of the initial level. This oportion of the commercial catch under the average age at maturity and the decline in aver- l females suggested that the fishery was being overexploited (Francis and Smith 1988). The ure rig in the commercial catch throughout New Zealand has increased since 1986 probably proportion of rig being landed by trawlers, and the use of small mesh net (125 mm) in the hese factors may have reduced the average age and fecundity of the stocks (Francis 1995).

ls of rig increased by more than 37% between 1991 and 1993 and the effect of this increase st, it will reduce the rate of stock rebuilding, and at worst it will reduce stock size. It is not current catch levels are sustainable or if they are at levels which will allow the stock to move vill support the MSY (Annala 1994).

mmercially caught school shark is 90 to 170 cm with a broad mode at 110-130 cm. This is a d females are believed not to mature until 110-115 and 120-130 respectively. (Annala 1995) be learnt from Australia where recruitment overfishing has occurred to such an extent that red seriously threatened. Modelling work has indicated that the cumulative removal of the d females has produced a situation where although the faster growing young adults are still derate but declining numbers, a stock collapse is very probable (Annala 1995). Indications d at very low fishing levels is necessary for stock rebuilding and fishing pressure on large ld be minimised.

cant bycatch in bottom trawls but nothing is known of most species (Palmer 1994). The com- dogfish is believed to have a break of 4 years between pregnancies hence, stock recovery

amount killed. This varies between methods, for example, where set netting is th caught in the nets will drop out while the net is being hauled and some will die la in the net. Under-reporting is also a problem and for low value species, good qua result is that landings may substantially underestimate catch, however, the extent

New Zealand aims to increase the percentage of catch taken by the domestic sect providing more incentive for New Zealand-owned operations to take care of their controlled vessels (includes domestic and charter) took 99.8 % of the total catch of total catch was taken by foreign licensed vessels (NZFIB Economic Review 199

A major problem with Chondrichthyan exploitation is that much of the catch is a fisheries for more fecund teleosts. These teleost fisheries can continue well beyon fish stocks that are caught by them (Compagno 1990).

Recommendations:

Greater emphasis should be placed on accurate recording of shark catches, and be grams. Under-reporting and misidentification is a currently a major problem. Ke chondricthyan catches should be a requirement of the catch, effort and landing re

- Greater emphasis should be placed on accurate recording of shark catches, a observer programs. Under-reporting and misidentification is currently a maj all chondricthyan catches should be a requirement of the catch, effort and la
- Fishing pressure on mature female school sharks should be minimized, to pre has occurred in Australia.
- Where sharks are taken as incidental catch and fins are retained, the trunks subsidiary agreement between the Governments of Australia and Japan conc Australian waters (East Coast Tuna and Billfish Fishery Assessment Group 1
- More research into biological stock boundaries should be undertaken as biol coincide with fishstock boundaries, consequently management by quota with optimal for individual stocks.
- There should be greater monitoring of the trade in shark products such as fir records of import and export of shark products by the Customs Department.

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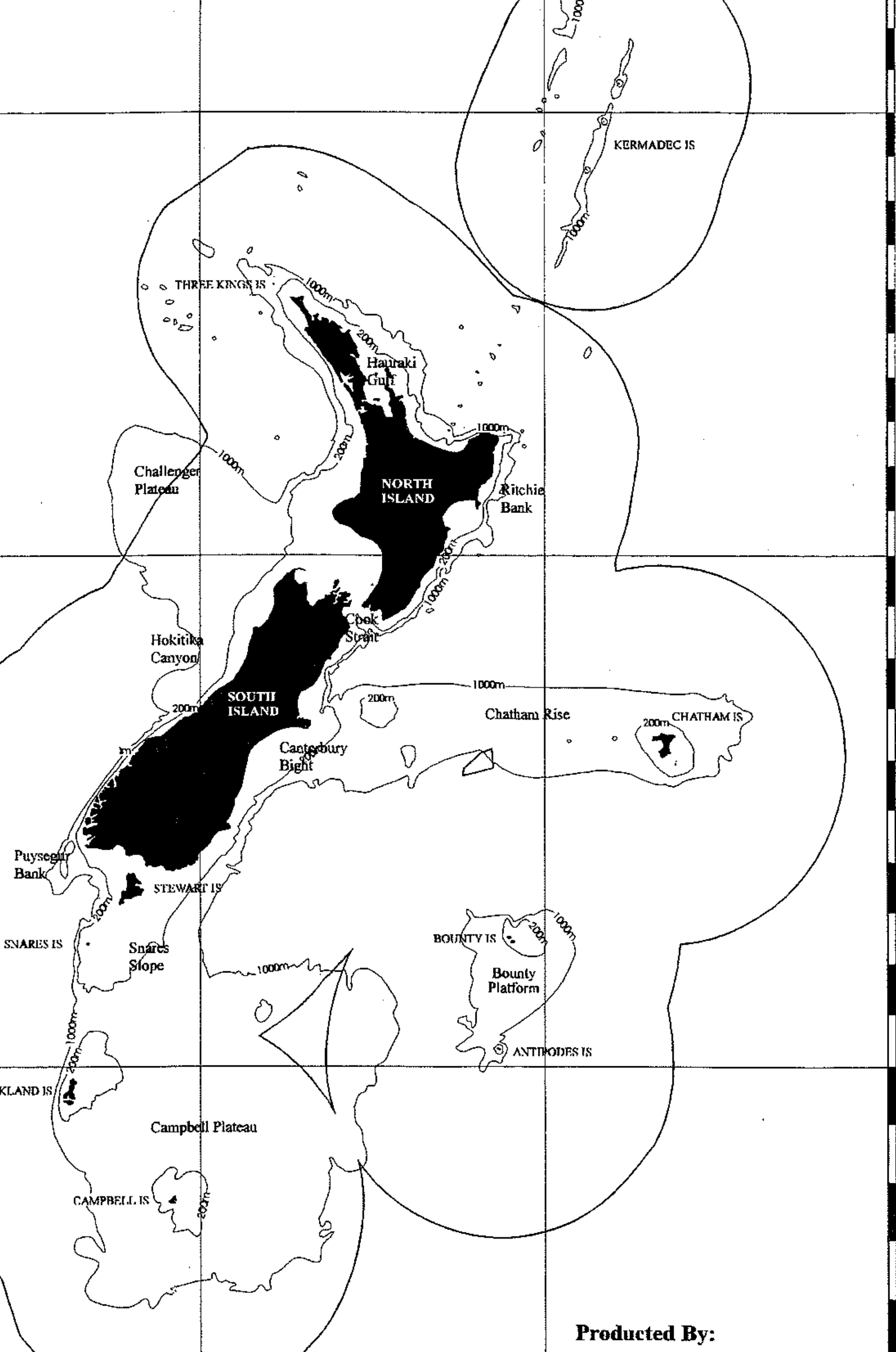

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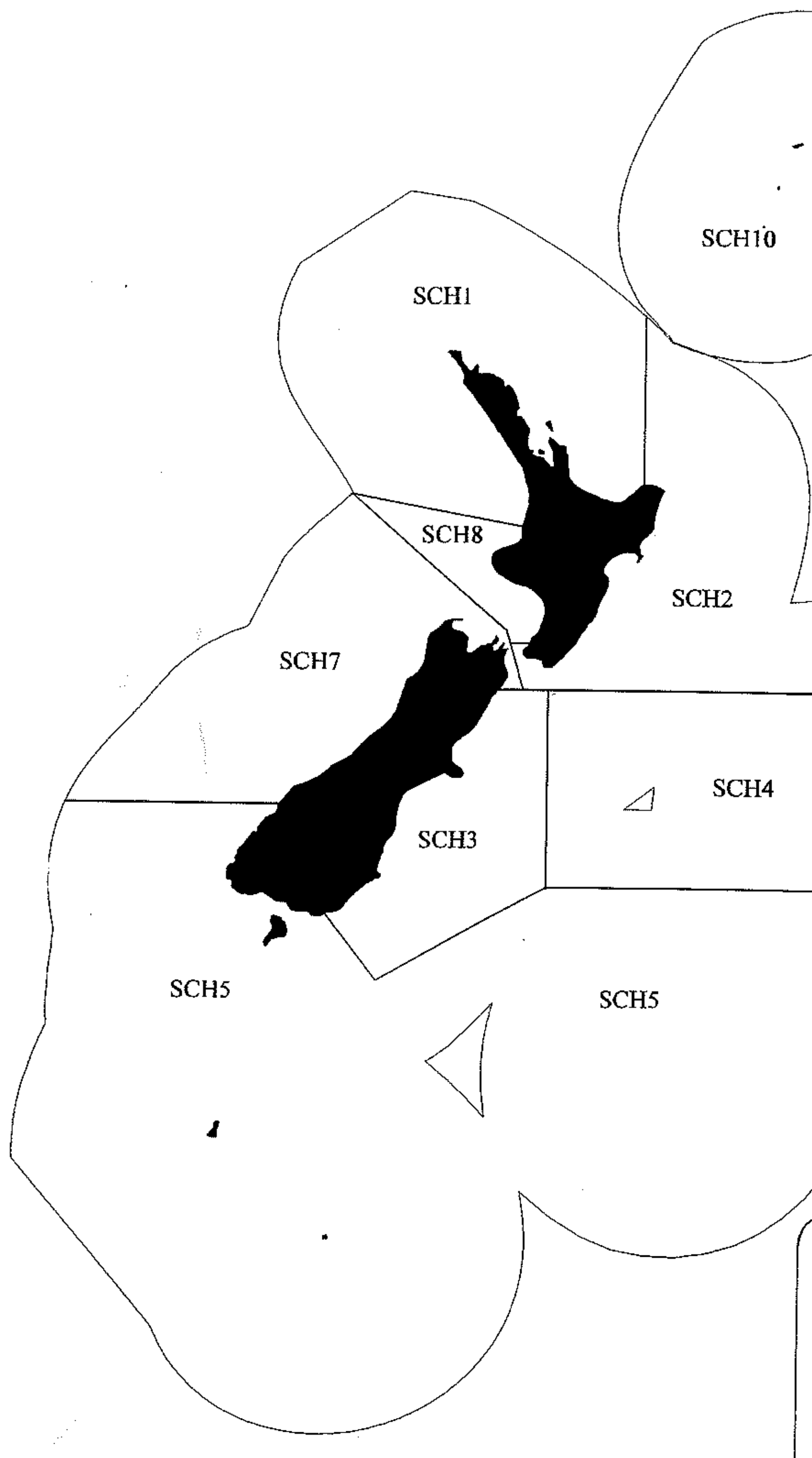
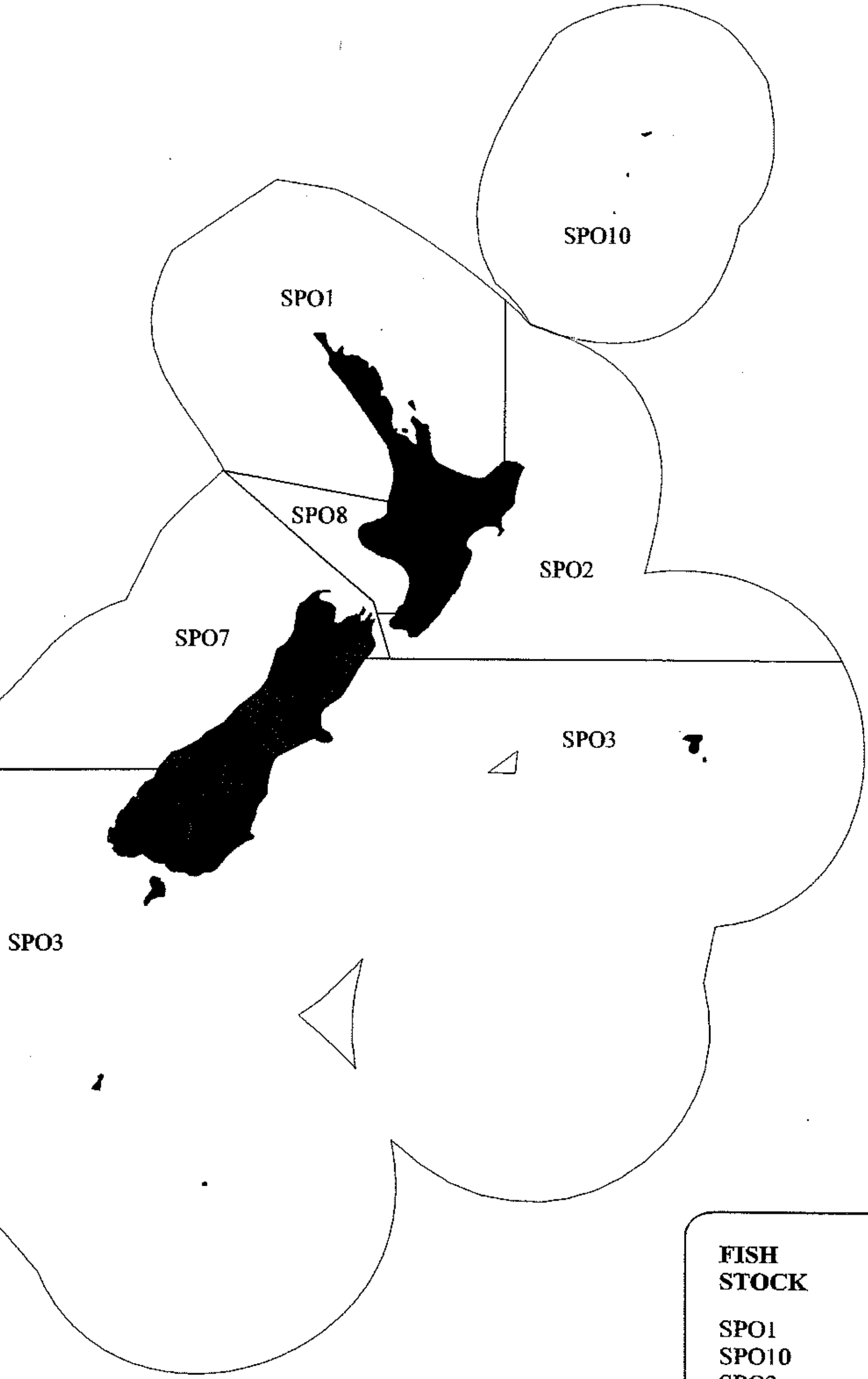
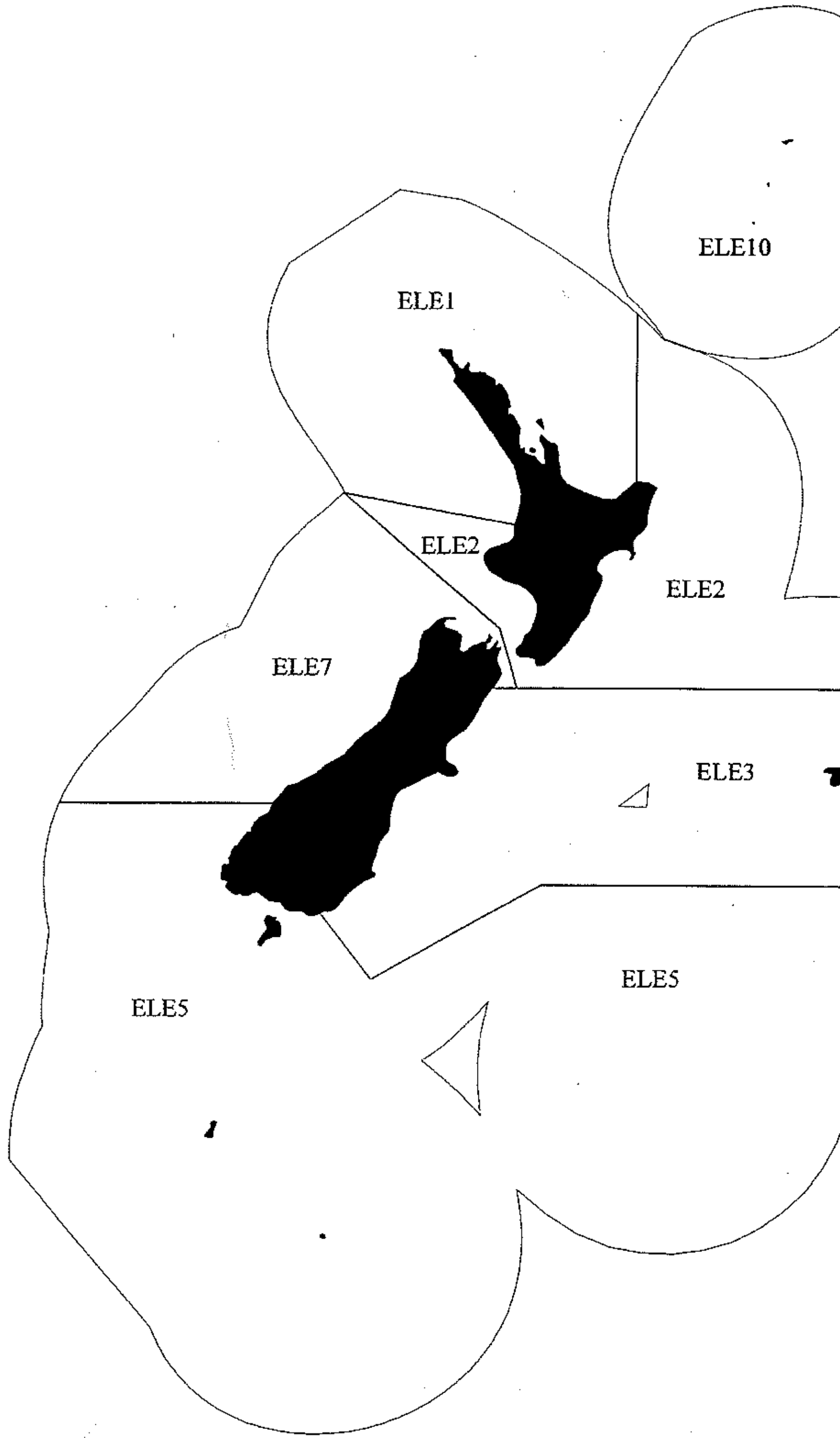




FISH STOCK	TACC 1995/96
SPO1	829.000
SPO10	10.000
SPO2	85.500



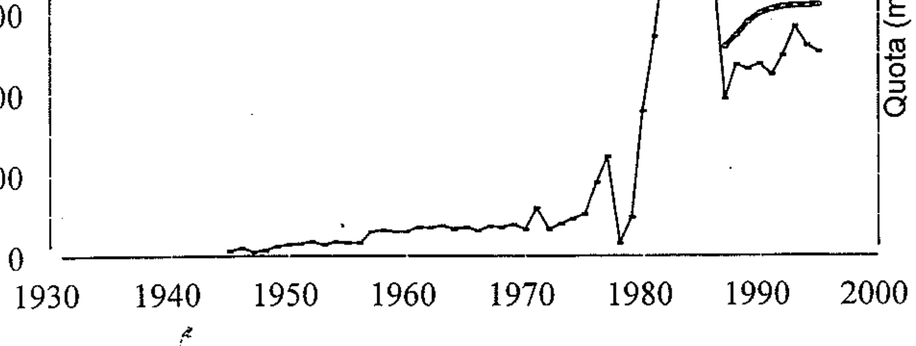


Figure 5. School shark catch & quota, 1945 - 1995.

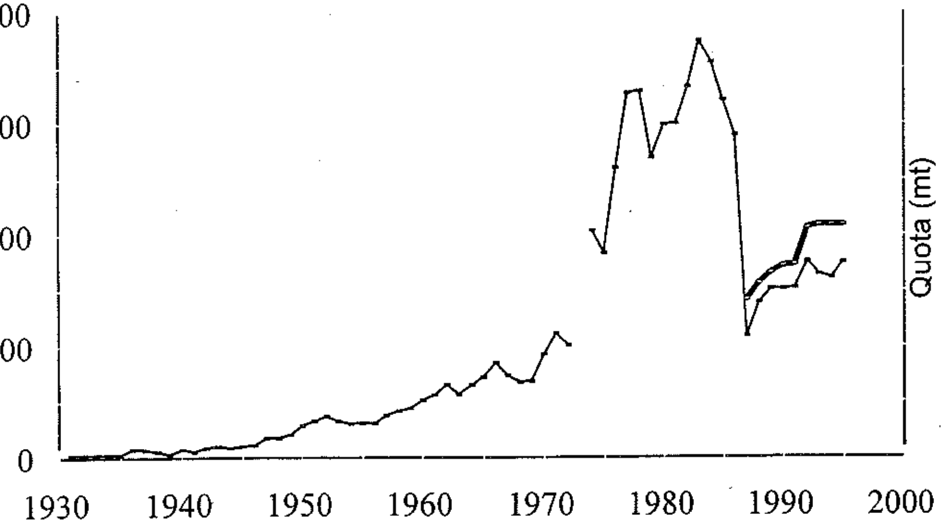
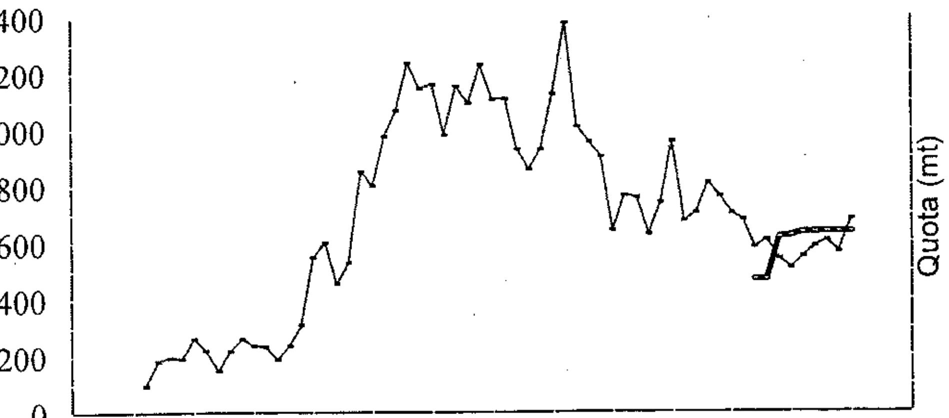


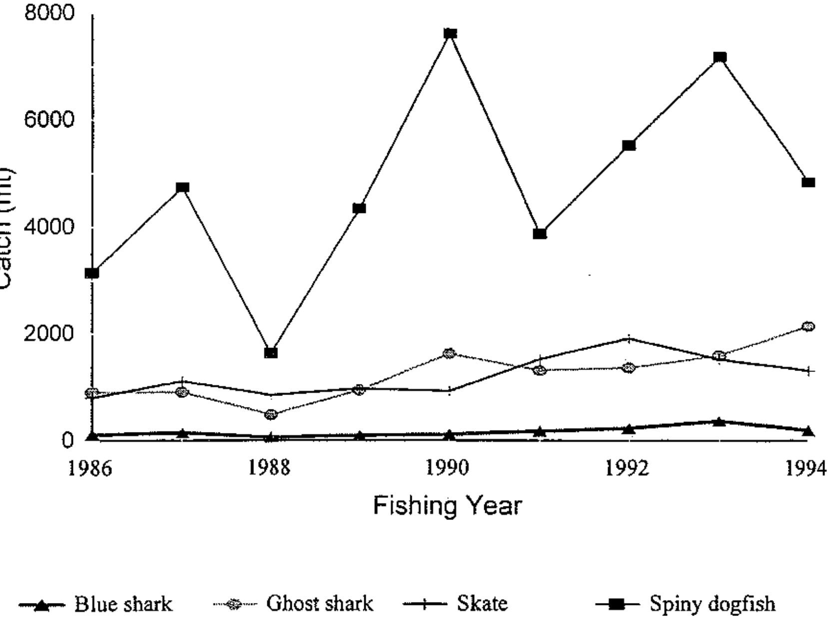
Figure 6. Rig catch & quota, 1931 -1995.



Family	Common Name	Estim Catch
Rhynchobatidae	Sharkfin Guitarfishes	
Charcharinidae	Whaler Sharks	
Dasyatididae	Stingrays	
Pristidae	Sawsharks	
Sphyrnidae	Hammerhead Sharks	
Hemigaleidae	Weasel Sharks	
Orectolobidae	Wobbegongs	
Gynuridae	Butterfly Rays	
Myliobatididae	Eagle Rays	
Urolophidae	Stingarees	
Rajidae	Skates	
Total		2

Table 9. Estimated catch of various chondrichthyan families i
of the NPF during 1988.

Source: Pender et al 1992



ure 8. Catch of the main non-quota species from the New Zealand Exclusive Economic Zone. Information from the Catch, Effort, Landing and Return databases as at 20 November 1995. Source: Clements and Associates, 1995.

lue shark *Prionace glauca*

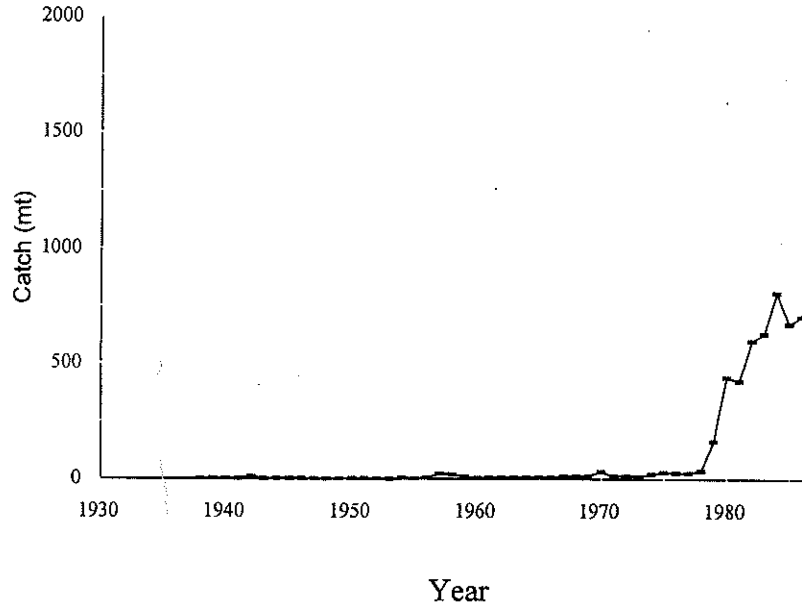


Figure 9. Annual commercial skate catch in New Zealand, 1
Source: NIWA unpublished information.

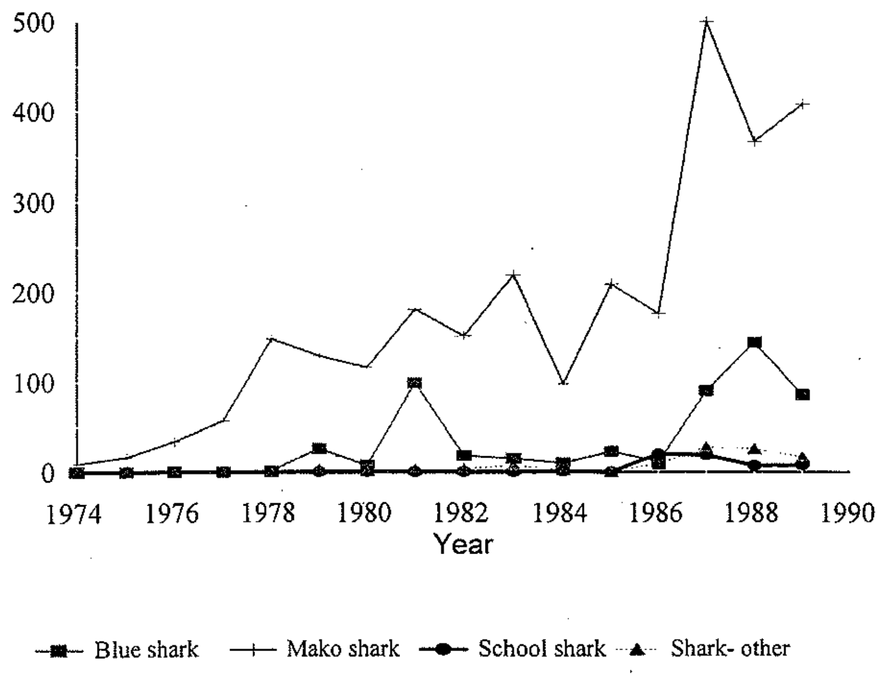


Figure 10. Number and species of shark tagged and released from Gamefishing captures, 1974 - 1989.
Source: New Zealand gamefishing records.

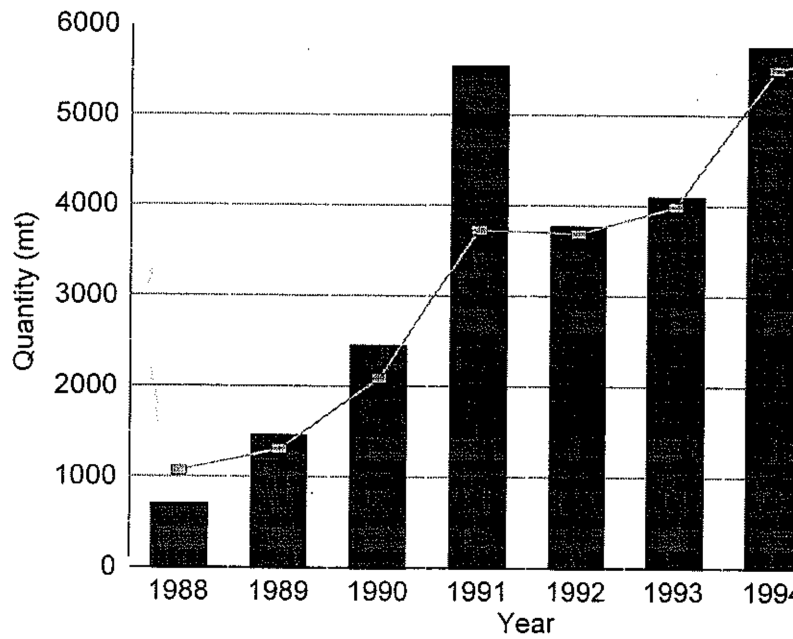
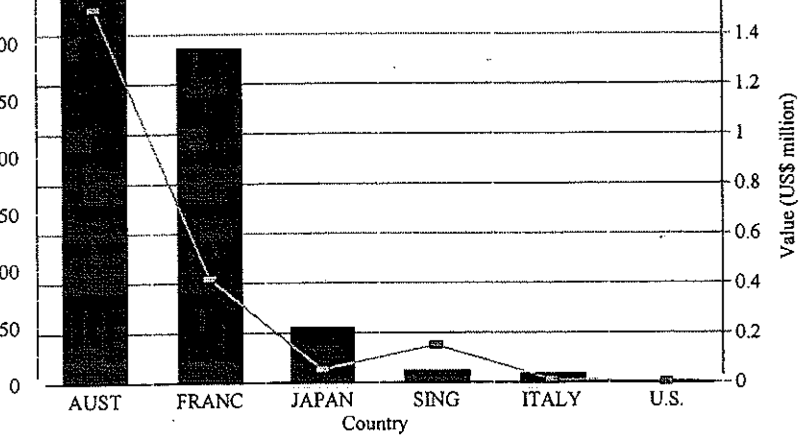
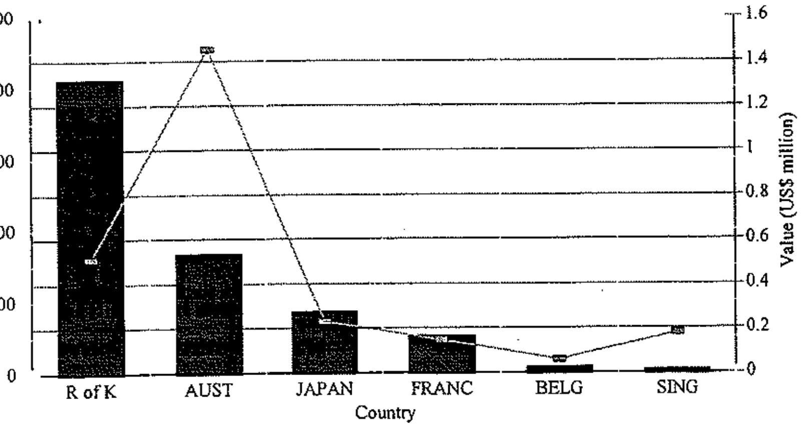


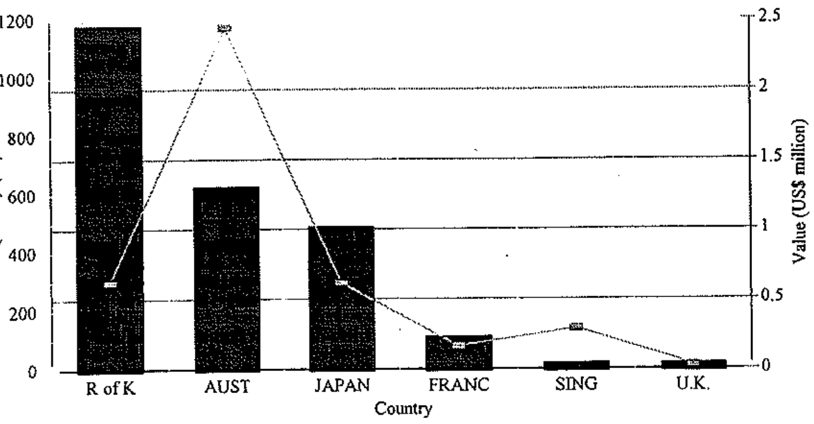
Figure 11. Quantity (mt) and value (US$) of shark exports New Zealand, 1988 - 1995.



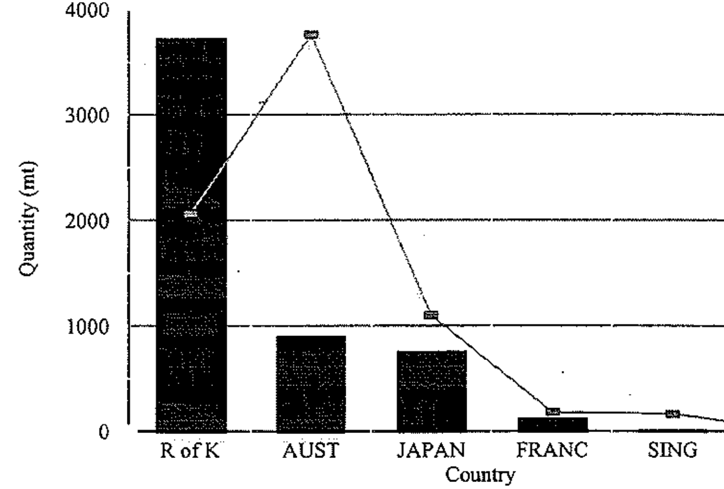
B. 1989



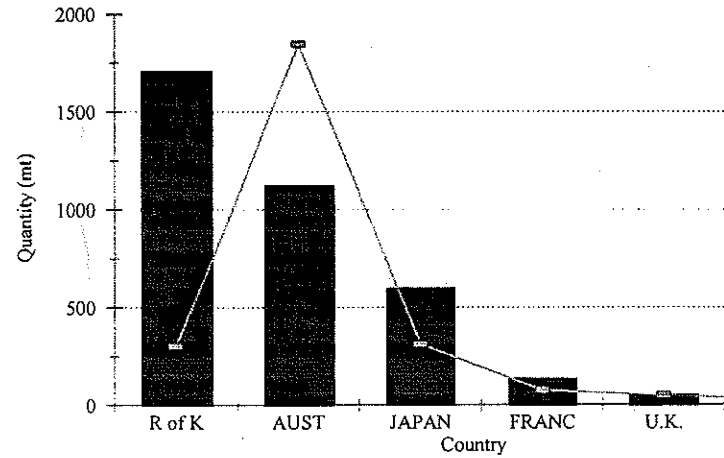
C. 1990



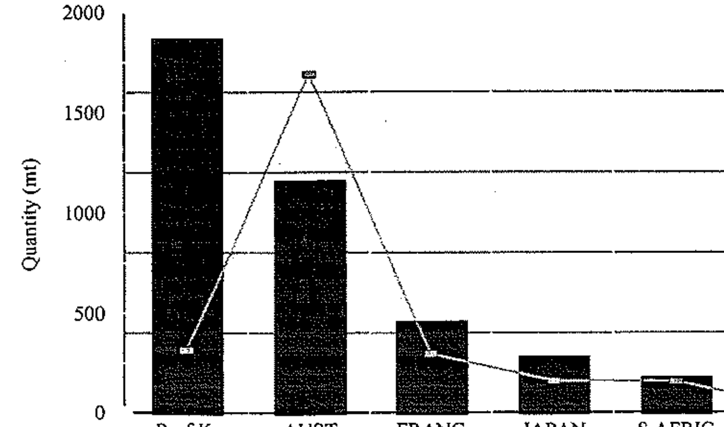
12. Export quantity (mt) and value (US$) of chondrichthyans from



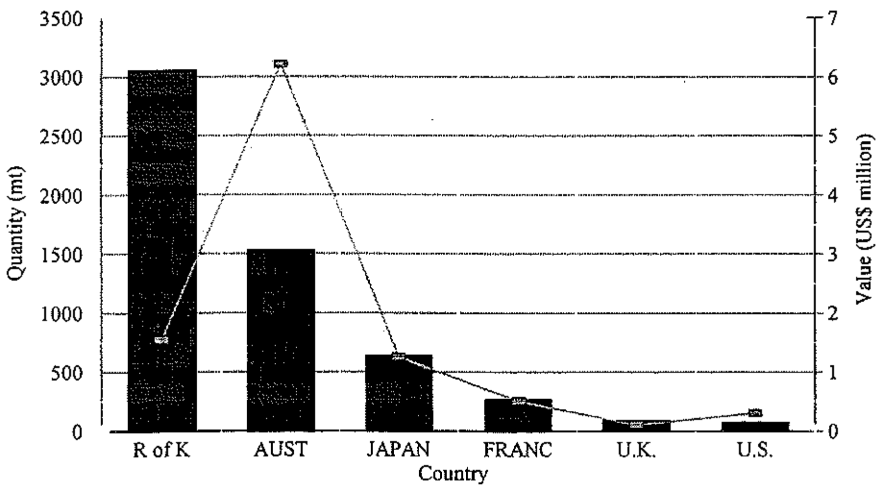
E. 1992



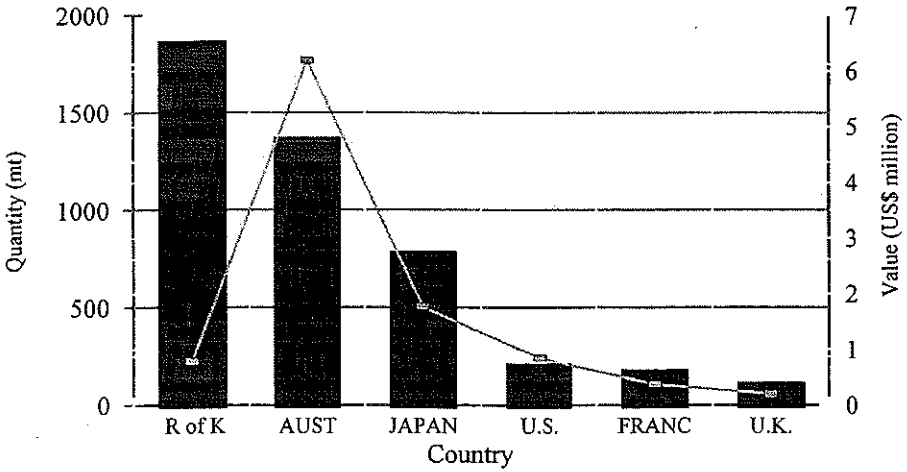
F. 1993

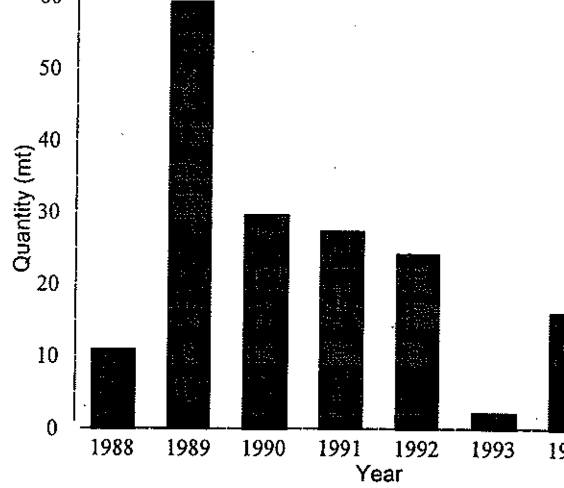


G. 1994

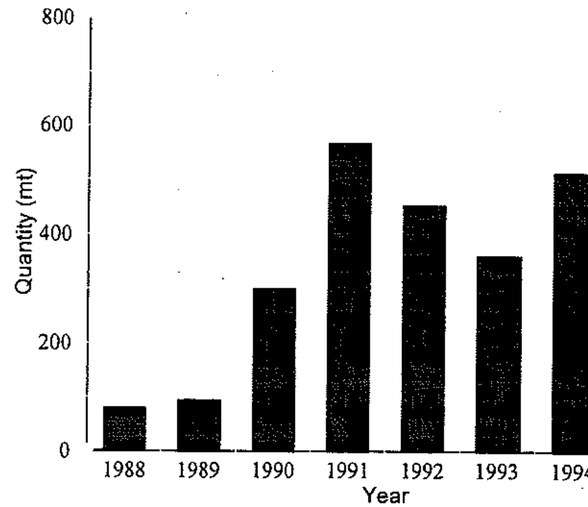


H. 1995

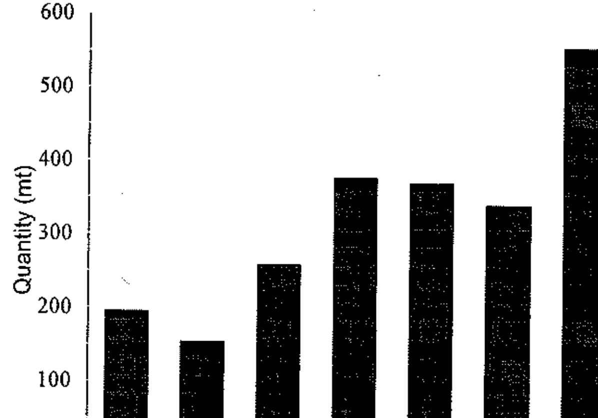


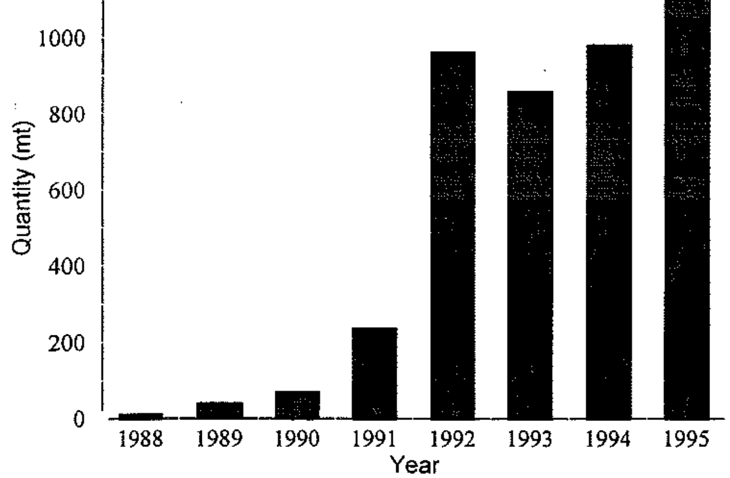


B. Ghost shark

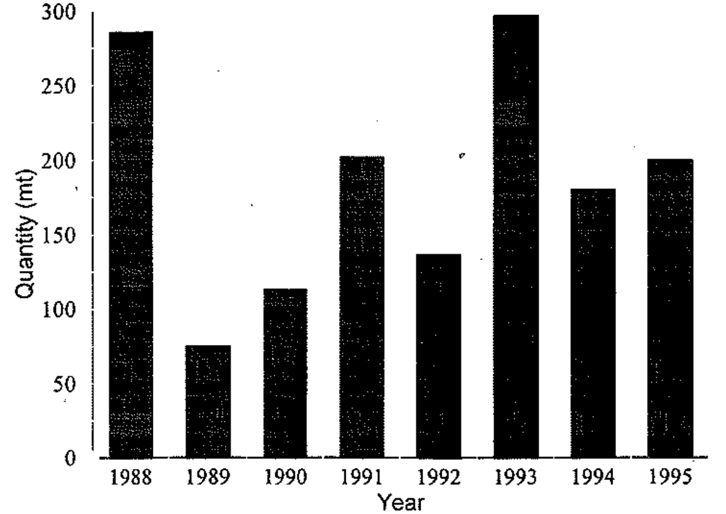


C. School shark

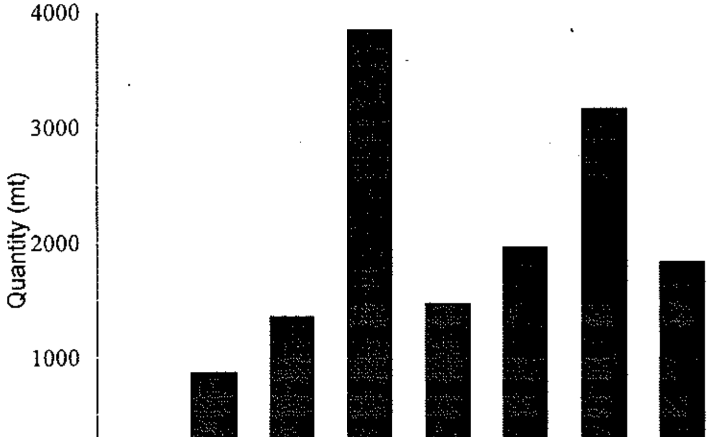




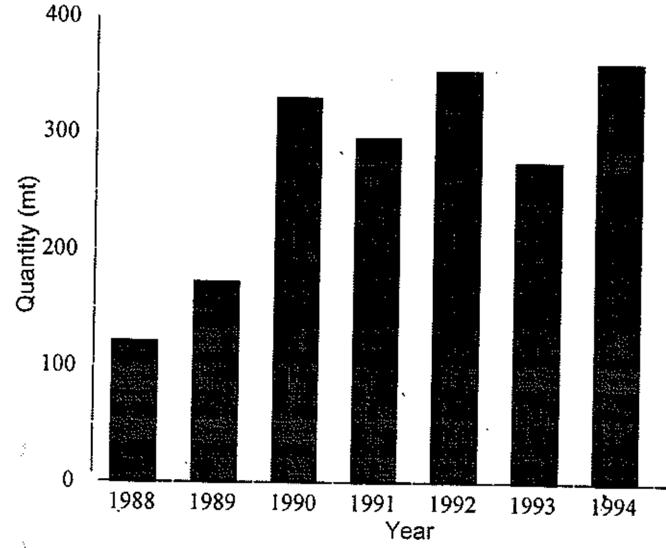
E. Skate



F. Spiny dogfish



G. Rig



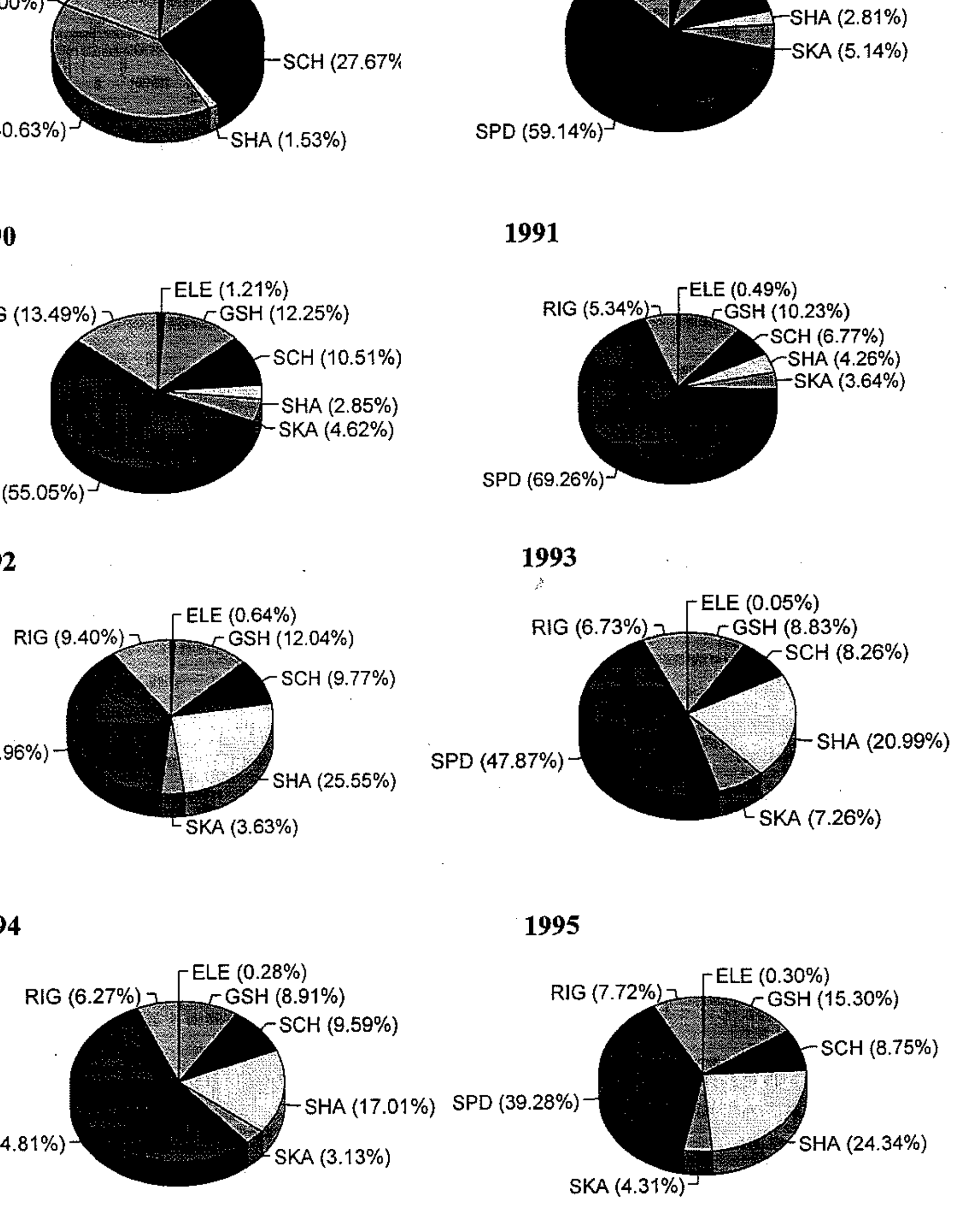


Figure 14. Species composition (percentage) of chondrichthyans exported from New Zealand, 1988 to 1995.

n the distributions, habitat preferences and life history characteristics of selected species of chondrichthyans found in Australian waters. †PR: productivity rating Distribution, A: Atlantic, I: Indian, P: Pacific, E: Eastern, W: Western, NG: New Guinea, AU: Australia, S: Solomon Islands; *D/P, D: Demersal, P: Pelagic; #Area: CSh: C ntinental Slope, CSI: Continental Slope, ISh Insular Shelves, AP: Abyssal Plains, Oc: Oceanic. Growth: Brody growth coefficient (K), all values from Pratt and Casey (19 ort and Stevens.

		Habitat					Size			Rep
	Species Name	Distribution°	D/P *	Area#	Depth (m)	Growth (K)	M	F	Max.	Reprod. Mode
ern Shark	*Etmopterus lucifer*	A,I,WP	D	CSh & ISh	183-1000		30	34	47	OVO
	Dalatias licha	A,I,P	D	CSh & CSI	40-1800		100	120	160	OVO
sh	*Centrophorus harrisoni*	Endemic	D	CSI	220-790		85		110	OVO
fish	*C. moluccensis*	I,WP	D	CSh & UCSI	125-820		70		100	
ish	*Centroscymnus coelolepis*	A,WP	D	CSI & AP	270-3700		85	100	120	OVO
	C. crepidater	EA,I,P	D	CSI	270-1300		60	80	105	OVO
	C. owstoni	WA,EI,WP	D	UCSI	500-1400		70	100	120	OVO
	Deania calcea	EA,EI,P	D	CSI & Outer Sh	400-900		70	70	113	OVO
og	*Squalus mitsukurii*	A,I,P	D	CSI	180-600		61		76	
	Squalus megalops	Endemic	D	CSh & UCSI			34		62	
	Zameus squamulosus	A,I,WP	D or P	CSI & SM	555-2000		47		>84	
lae										
ark	*Pristiophorus cirratus*	Endemic	D	CSh	40-310		97		>134	OVO
ark	*P. nudipinnis*	Endemic	D	CSh	<70		90		>99	OVO
lae										
ark	*Heterodontus portusjacksoni*	Endemic	D	CSh	<275		75	85-90	165	OVI
e										
gong	*Orectolobus sp*	Endemic	D	CSh					200	OVO
ong	*O. maculatus*	Endemic	D	CSh	<110		60		>300	OVO
ong	*O. ornatus*	NG & AU	D	CSh	<100		175		290	OVO

head	*S. mokarran*	A,I,P	D	CSh & ISh	0->80		225	210	600	VIV
erhead	*S. zygaena*	A,I,P	P	CSh & ISh	0->20		250	265	350	VIV
e										
el Shark	*Squatina australis*	Endemic	D	CSh	0-130				152	
hark	*S. tergocellata*	Endemic	D	CSh & UCSI	130-400				100	
ne										
nose Ray	*Aptychotrema rostrata*	Endemic	D	CSh	0-50				120	
Ray	*Trygonorrhina sp*	Endemic	D	CSh	0-100				92	
er Ray	*Trygonorrhina fasciata*	Endemic	D	CSh					97	
tidae										
	Rhina ancylostoma	I,WP	D	CSh					270	
Guitarfish	*Rhynchobatus djiddensis*	I,WP	D	CSh			110		300	
	Pavoraja nitida	Endemic	D	CSh	30-390		33		35	
e	*Raja sp*	Endemic	D	CSh	40-250		47-53		70	
	R. austalis	Endemic	D	CSh	50-180		43-48		50	
Skate	*R. cerva*	Endemic	D	CSh & UCSI	20-470		45		60	
	R. gudgeri	Endemic	D	CSh & UCSI	160-700		127		140	
te	*R. lemprieri*	Endemic	D	CSh	0-170		39		52	
te	*R. whitleyi*	Endemic	D	CSh	0-170				170	
	Pristis zijsron	I,WP	D	CSh			430		730	
mbfish	*Narcine tasmaniensis*	Endemic	D	CSh	10-640				>47	
e										
aree	*Trygonoptera testacea*	Endemic	D	CSh	0-60		31		47	VIV
ree	*Urolophus cruciatus*	Endemic	D	CSh	0->150				50	VIV
ed Stingaree	*U. paucimaculatus*	Endemic	D	CSh	0-160				>44	VIV
garee	*U. viridis*	Endemic	D	CSh	20-200				>44	VIV
e										
erfly Ray	*Gymnura australis*	NG & AU	D	CSh	0-50		35-40		>73	VIV
idae										
	Callorhinchus milii	NZ & AU	D	CSh	0-200		65		120	OVI
e										
aera	*Chimaera sp*	Endemic	D	CSI	300-850				>90	
hark	*Hydrolagus ogilbyi*	Endemic	D	CSh & UCSI	120-350		70		>85	

e	Species Name	Distribution°	D/P *	Area#	Depth (m)	Growth (K)	M	F	Max.	Reprod. Mode
dae										
Shark	*Cephaloscyllium sp*	Endemic	D	UCSI	240-550		70		94	OVO
Shark	*C. laticeps*	Endemic	D	CSh			82		100	OVO
	Galeus boardmani	Endemic	D	Outer CSh	150-640		40	43	61	
k	*Furgaleus macki*	Endemic	D	CSh	<220		120	120	160	OVO
	Galeorhincus galeus	A,P	D	CSh, ISh & UCSI	0-550	0.16	120	130	175	OVO
	Hypogaleus hyugaensis	I,WP	D	CSh	40-230		95	95	>135	VIV
	Mustelus antarcticus	Endemic	D	CSh	0-80		80	85	175	OVO
e										
	Hemigaleus microstoma	I,WP	D	CSh & ISh	0-170		60	65	110	VIV
	Hemipristis elongata	I,WP	D	CSh & ISh	0-130		110	120	230	VIV
ae										
	Carcharinus amblyrhynchoides	I,WP	P	CSh & ISh	0->50	0.29	110-115	110-115	170	VIV
	C. amboinensis	EA,I,WP	D	CSh & ISh	0-100		219	215	280	VIV
	C. brachyurus	A,I,P	D	CSh	0-100		235	245	295	VIV
	C. brevipinna	A,I,WP	P	CSh & ISh	0->75	0.21	190-200	190-200	280	VIV
	C. cautus	S,NG &AU		CSh & ISh	0-100		80-85	80-85	150	VIV
ark	*C. dussumieri*	I,WP	D	CSh & ISh	0-170		70	70	90	VIV
	C. falciformis	A,I,P	P	CSh & ISh	0-550	0.05 - 0.15	200-210	200-210	330	VIV
	C. fitroyensis	Endemic		CSh	0-40		80	90	135	VIV
ip Shark	*C. limbatus*	A,I,P	P	CSh & ISh		0.20 - 0.27	135-180	120-190	250	VIV
p Shark	*C. longimanus*	A,I,P	P	Csh	0-150	0.04	175-195	180-200	300	VIV
k	*C. macloti*	I,WP	P	CSh & ISh	0-170		70-75	70-75	110	VIV
	C. obscurus	A,I,P	D	CSh & ISh	0-400	0.01 - 0.03	280	280	365	VIV
	C. plumbeus	A,I,P	D	CSh & ISh	0-280	0.06	155	155	240	VIV
	C. sorrah	I,WP	P	CSh & ISh	[illegible]	[illegible]				

angel shark (Data from Walker et al 1995)

Species	Catch (t)	Proportion
Gummy Shark	1814	55%
School Shark	959	30%
Saw Shark	301	9%
Elephant Fish	66	2%
Other shark	132	4%

atches in the Western Australian South Coast Shark Fishery Zone 1 for the period July 1993 to
Other shark' includes sandbar, school, pencil, spurdog, spinner and grey nurse sharks (Data from Simpfendorfer and Lenanton 1995).

Species	Catch (t)	Proportion
Dusky Shark	190.2	58.7%
Whiskery Shark	67.1	20.7%
Wobbegong Shark	14.9	4.6%
Gummy Shark	7.5	2.3%
Hammerhead Sharks	4.5	1.4%
Other shark	39.9	12.3%

atches in the Western Australian South Coast Shark Fishery Zone 2 for the period July 1993 to
'Other shark' includes sandbar, wobbegong, pencil, blacktip and grey nurse sharks (Data from Simpfendorfer and Lenanton 1995).

Species	Catch (t)	Proportion
Gummy Shark	228.8	34.4%
Dusky Shark	138.3	20.8%
School Shark	137.0	20.6%
Whiskery Shark	85.1	12.8%
'Spurdog' (F.Squalidae)	45.2	6.8%
Hammerhead Sharks	12.6	1.9%

Species	Catch (t)
Dusky Shark	142.8
Sandbar Shark	66.8
Whiskery Shark	52.6
Wobbegong Sharks	30.0
Spinner Shark	19.6
Hammerhead Sharks	16.9
Other shark	55.3

Table 6. Catches in the Western Australian North Coast Shark Fishery for the pe
(Data from Simpfendorfer in litt. 1995).

Species	Catch (t)
Tiger Shark	116
Spinner Shark	30
Hammerhead Sharks	14
Sandbar Shark	11
Dusky Shark	10
Grey Nurse Shark	2
Other shark	92

Table 7. Composition of the chondrichthyan catch in the Northern Pelagic

Species	Gillnet
Australian Blacktip Shark	56.8%
Spot-tail Shark	20.3%
Hardnose Shark	14.6%
Graceful Shark	2.0%
Milk Shark	2.1%
Pigeye Shark	0.5%
Whitecheek Shark	0.3%

es	North Catch (t)	North SE	North % D	Ulladulla Catch (t)	Ulladulla SE	Ulladulla % D	Eden Catch (t)	Eden SE	Eden % D	Total Catch (t)	Total SE	Total % D
Spurdog	36	14	11	67	12	1	210	25	80	313	31	55
sh (*Daenia spp*)				2	1	0	121	40	0	123	40	0
l Shark (*Squatina spp*)	18	4	1	56	5	0	18	2	1	93	7	1
non Sawshark	18	3	1	21	2	1	10	2	2	49	4	1
rn Shovelnose Ray	36	7	3	1	0	2				38	7	3
Rays (*Myliobatus spp*)	23	3	9	3	1	3	1	1	0	27	3	6
ny Shark	3	1	3	5	1	0	17	2	5	25	2	4
sh (*Centrophorus spp*)	1	1	0	12	3	0	7	2	0	20	3	0
er Shark	18	10	0							18	10	0
r Ray (*Trygonorrhina spp*)	13	2	13	3	1	5				17	2	11
r Sharks (*Carcharinus spp*)	7	3	36	1	1	0	5	3	82	13	4	60
's Ghostshark	1	0	88				8	2	20	9	2	29
her Shark							8	5	94	8	5	86
th Hammerhead	7	1	0							7	1	0
eye Spurdog							6	5	17	7	5	15
ed Wobbegong	3	1	2							4	1	2
Tiger Shark (*Odontaspis ferox*)	1	1	0	2	1	51				3	2	29
Shark	2	1	38							2	1	0
l Shark							2	1	0	2	1	38
Shark (*Mitsukurina owstoni*)							2	2	0	2	2	0
Shark (*Dalatias licha*)							1	1	3	2	1	3

	Year 93/94	Year 94/95
Angel	48.1	89.3
Saw	17.7	20.8
Gummy	3.7	7.5
Wobbegong	9.7	2.1
School	1.3	1.9
Other sharks	1.8	2.3

Table 10. Recorded catches of sharks in the Great Australian Bight trawl fishery in 1993/94 and 1994/95.

Source: T. Walker, in litt. 1995

East Coast				Tasmania				GAB & West Coast		
Jan. - Dec. 1994 (5.0%)				May - Aug. 1994				Nov. 1993 - Jul. 1994 (3.6%)		
Landed				Landed				Landed		
Retained	Released	Not Landed	NS	Retained	Released	Not Landed	NS	Retained	Released	Not Landed
331	41	108	2	251	4816	771	107	11	3	6
1	3			113	265	18	7			
2	10				1				304	15
	123	81	1						1	
10		2				13		44	3	108
116	17	7	1	23	3	2		2	1	
81		11						1	1	
53	7	2		3	3			1		1
				3	53	1				
30		1		2		3				5
					23	2				
11		1		7		1			2	1
					19	1				
5	1	13								
14		1						1		1
7	8									
1										

...uding whalers sharks and milk sharks. (Data from Stevens and Davenport (1991).

...ecies	Catch (t)	Proportion
...tralian Blacktip Shark	-	39.4%
...t-tail Shark	-	16.3%
...nmerhead Sharks†	-	7.0%
...gtail Tuna (*Thunnus tonggol*)	-	15.1%
...nish Mackerels (*Scomberomorus spp*)	-	7.9%
...er	-	14.3%

	Number retained	Percentage
Gummy	48	0.12
Whalers	25	0.06
Mako	24	0.06
Hammerhead	12	0.03
Shovelnose Ray	9	0.02
Wobbegong	6	0.01
Port Jackson	4	0.01
School	4	0.01
Angel	1	<0.01
Tiger	1	<0.01
Other Shark	13	0.03
Stingrays	2	<0.01
All species	40923	

Table 13. Observed catches (numbers) of chondrichthyans by NSW recreational fishers.

Source: A. Steffe and G. Murphy, in litt. 1995

identifying some sharks to the species level so that in some cases only the genu
brackets indicate the number of possible species in each genus (Data

Species	Catch (#)
Hammerhead Sharks (3)	68.8
Whaler Sharks (10)	45.6
Australian Angel Shark	9.8
Tiger Shark	13.0
Blacktip Whaler	9.2
White Shark	5.8
Seven Gill Shark	2.4
Port Jackson Sharks (2)	2.2
Grey Nurse Shark	1.2
Shortfin Mako	1.2
Wobbegong (2)	0.6
Thresher Sharks (2)	0.4

Table 15. Average annual catches of sharks in the Queensland Beach Meshing
and June 1991 (Data from QDPI 1992).

Species	Catch (#)	P
Tiger Shark	309.0	
Other Whaler Sharks	236.2	
Hammerhead Sharks	179.4	
Blacktip Whaler	177.0	
White Shark	11.4	
Grey Nurse Shark	2.2	
Mako	2.0	
Other shark	54.2	

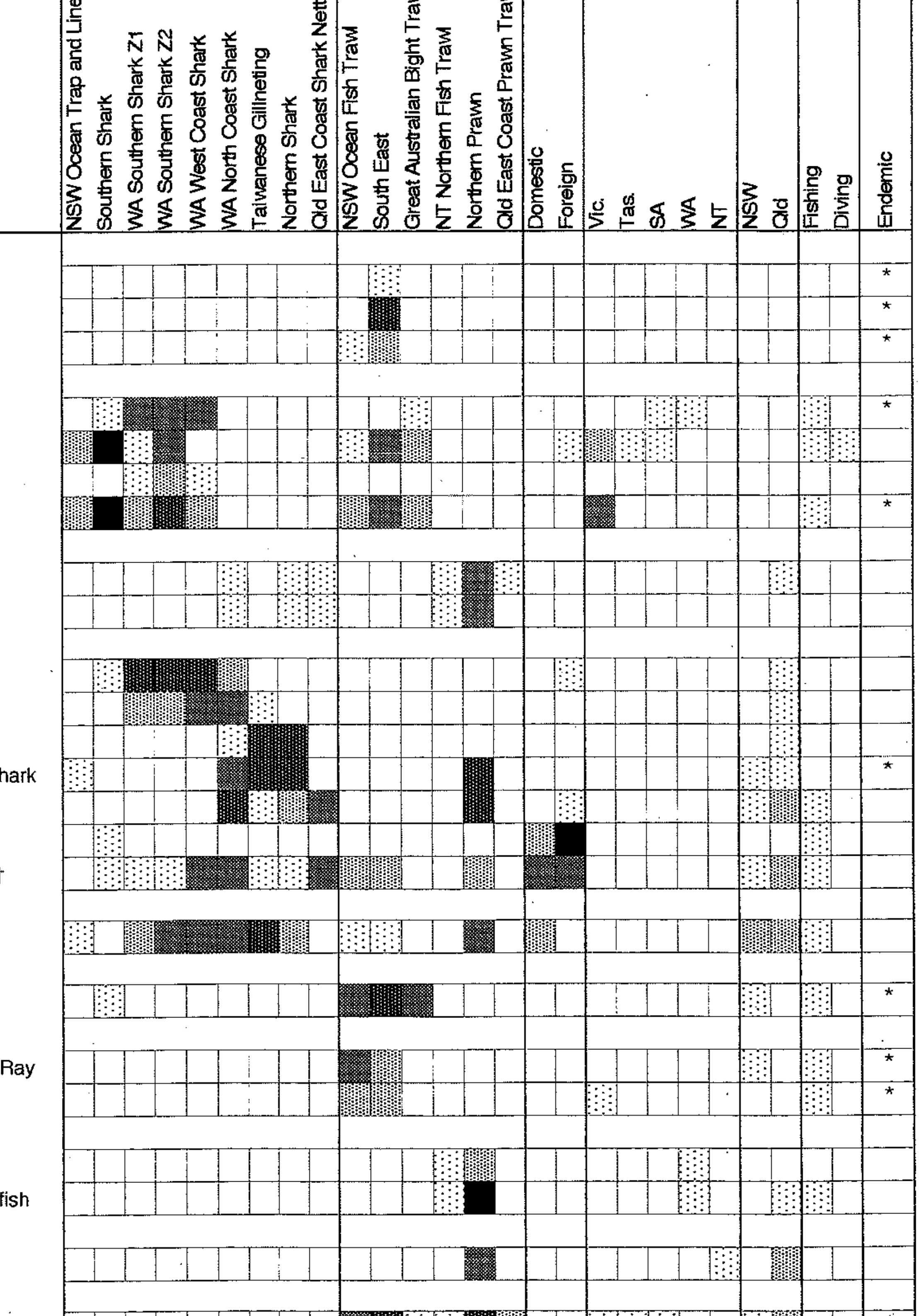
pecies/Group	Catch (#)	Proportion
ay	301.6	55.6%
awfish	66.7	12.3%
ovelnose Ray	14.0	2.6%
na	6.4	1.2%
oper	0.9	0.2%
wfish	0.9	0.2%
arlin	0.2	0.0%
rtle	109.1	20.1%
rpoise	12.6	2.3%
hale	0.3	0.1%
gong	29.2	5.4%

to difficulties in identification and the low resolution of some catch statistics these ha

families Rajidae, Dasyatidae, Urolophidae, Anacanthobatidae, Torpedinidae, Hyp
Myliobatididae, Rhinopteridae and Mobulidae.

Key (tonnes/year) <1 | 1 to 10 | 11 to 100

	Target Shark									Demersal Trawl						Tuna	
	NSW Ocean Trap and Line	Southern Shark	WA Southern Shark Zone 1	WA Southern Shark Zone 2	WA West Coast Shark	WA North Coast Shark	Taiwanese Gillneting	Northern Shark	Qld East Coast Shark Netting	NSW Ocean Fish Trawl	South East	Great Australian Bight Trawl	NT Northern Fish Trawl	Northern Prawn	Qld East Coast Prawn Trawl	Domestic	Foreign
F. Squalidae																	
Blackbelly Lantern Shark										<1	<1	<1					
Black Shark										<1	11 to 100	<1					
Harrison's Dogfish		<1								<1	<1						
Endeavour Dogfish		<1		11 to 100						11 to 100	11 to 100						
Portugese Dogfish											<1						
Golden Dogfish											1 to 10	<1					
Owston' Dogfish										<1	<1	<1					<1
Brier Shark										<1	11 to 100	<1					
Greeneye Spurdog		<1		11 to 100						11 to 100	11 to 100	<1					
Piked Spurdog										11 to 100	11 to 100	<1					
Velvet Dogfish																	<1
F. Pristiophoridae																	
Sawsharks†		11 to 100	<1	<1	<1					<1	<1	1 to 10					
F. Heterodontidae																	
Port Jackson Shark		<1	<1	<1	<1					<1	11 to 100	<1					
F. Orectolobidae																	
Wobbegongs†	11 to 100	<1	1 to 10	1 to 10	11 to 100					1 to 10	1 to 10	1 to 10		11 to 100			
F. Rhincodontodae																	
Whale Shark																	
F. Odontaspididae																	
Grey Nurse Shark	<1		<1	<1	1 to 10	1 to 10			1 to 10								
F. Alopiidae																	
Thresher Shark										<1	<1						<1



	State				
Year	Vic	SA	NSW	WA	Qld.
1988	8.0	11.1	0.0	22.0	0.0
1989	10.0	0.0	0.0	0.0	0.0
1990	6.9	0.0	2.5	0.0	0.0
1991	0.6	0.0	0.0	0.0	0.0
1992	15.1	0.0	22.8	0.1	0.0
1993	10.9	1.3	2.1	0.8	0.2
1994	4.1	30.3	0.0	0.0	0.0
Percentage	37.3	28.7	18.4	15.5	0.1

Table 18. Quantity (t) of imports of frozen shark to each A
Source: ABS, in litt. 1995

1993

	Chilled				Frozen			
	Whole	Fillets	H&G	Other	Whole	Fillets	H&G	Other
sh	0.0	0.3	0.0	0.0	0.0	1.3	0.0	0.0
	0.0	3.7	0.0	0.0	0.3	80.3	0.0	1.4
rk	0.0	0.0	0.0	0.0	0.0	306.1	0.0	1.9
dog	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.1
ark	0.0	26.5	0.0	0.0	0.0	218.1	0.9	7.9
	6.5	0.0	21.6	40.1	0.0	0.0	0.0	0.0

	Quantity (t)	Value (US$ '000)	Quantity (t)	Value (US$ '000)
a	98.7	636.57	622.2	4550.4
	0.0	0.0	4.4	134.0

1994

	Chilled				Frozen			
	Whole	Fillets	H&G	Other	Whole	Fillets	H&G	Other
sh	0.0	0.0	0.0	0.0	1.2	15.0	0.0	0.0
	0.0	2.4	0.0	0.0	0.0	103.5	0.0	0.7
rk	0.0	0.0	0.0	0.0	1.7	487.2	0.0	3.7
dog	0.0	0.0	0.0	0.0	0.2	0.0	0.0	23.9
ark	0.0	12.3	0.0	0.0	0.6	347.4	0.0	0.6
	0.1	0.0	1.1	136.7	0.0	0.0	0.0	0.0

	Quantity (t)	Value (US$ '000)	Quantity (t)	Value (US$ '000)
a	152.5	1006.2	985.6	7199.9
	0.0	0.0	34.4	263.4

	1988	1989	1990	1991	1992	1993	1994
re		Q 0.5			V 2.4	WA 0.5	
a		WA 16.2					
ong						WA 1.1	
	NT 0.3			Q 2.0	RE 22.4 SA 1.5		
Kingdom				RE 0.5			
			Q < 0.1	Q 272.5			Q 5.0

. Quantity (t) of frozen shark exports from Australian states to various countries 1988 - 1994.

		Fins				Oil				Soup				Other		
		92/93	93/94	94/95		92/93	93/94	94/95		92/93	93/94	94/95		92/93	93/94	94/95
rth		8.5	7.6	9.9											0.0	0.0
uth		2.8	5.1	20.3											2.9	
			0.1											0.1	0.1	
		16.9	18.1	5.4								0.1		3.0	0.3	2.9
		0.4														
		18.7	7.2	6.5		31.9	17.1	2.0		0.1	11.1	1.9		0.0	1.5	0.6
		18.2	9.1	3.8											0.3	0.7
			2.7													
		65.5	49.9	45.9		31.9	17.1	2.0		0.1	11.1	2.0		3.1	5.2	4.2

1. Quantity (t) of shark products exported from Australia during 1993/94 and 1994/95
rded by the Australian Quarantine Inspection Service inspectors. VA: Value added
AQIS, in litt 1995.

Part	Treatment	Preservation	Quantity (t
Fins	Dried	-	99.
Fins	-	Frozen	24.
Fins	-	-	24.
Fins	Dried and VA	-	11.
Fins	Dried	Frozen	0.
Fins	Fermented	-	0.
Fins	Value Added	Canned	0.
Fins	Brined	Canned	0.
Oil	Cured	-	34.
Oil	-	-	10.
Oil	Fermented	-	5.8
Oil	-	Chilled	0.4
Soup	Cooked	Canned	12.6
Soup	Dried	Canned	0.5
Soup	-	Canned	0.1
Soup	Value Added	Canned	<0.1
Whole	Dried	-	1.4
Backbone	-	Frozen	0.9
Fillets	-	Chilled	0.2
Fillets	-	Frozen	0.1
Headed and gutted	-	Chilled	0.1
Dip	Dried	-	0.1
Unknown	Dried	-	8.2
Unknown	-	Frozen	1.4
Unknown	Dried and VA	-	0.1
Unknown	-	-	<0.1

Table 1. Total Allowable Commercial Catch (TACC), catch and % caught for the three quota managed shark species from the start of the quota management system. Source Atlas of area codes and TACCs, Clement 1995.

	Elephantfish			Rig			School shark		
Fishing year	TACC	Catch	% caught	TACC	Catch	% caught	TACC	Catch	% caught
1986/87	471.2	584.881	124.13	1424.7	1090.677	76.55	2592.5	1902.261	73.38
1987/88	480.9	611.645	127.19	1564.4	1392.519	89.01	2724.3	2412.719	88.56
1988/89	617.8	531.858	86.09	1662.4	1515.342	91.15	2886.4	2318.536	80.33
1989/90	622.2	512.284	82.33	1727.3	1514.952	87.71	2996.3	2386.908	79.66
1990/91	636.2	553.326	86.97	1737.4	1466.825	84.43	3048.8	2214.04	72.62
1991/92	636.2	587.644	92.37	2070	1763.745	85.21	3085.6	2479.37	80.35
1992/93	638.4	607.084	95.09	2096.6	1650.627	78.73	3092.8	2840.298	91.84
1993/94	638.4	567.024	88.82	2096.6	1620.696	77.3	3092.8	2603.111	84.17
1994/95	638.4	683.792	107.11	2098.4	1758.331	83.79	3105.4	2530.983	81.5

from Catch. effort and landing return (CELR) and (CLR) databases. Excludes foreign longline landi NIWAR Fisheries, unpublished data.

species	code	89/90	90
Scymnorhinus licha	BSH	107.9	12
Cetorhinus maximus	BSK	0.4	90
Carcharhinus brachyurus	BWH	10.3	14
Prionace glauca	BWS	12.5	2.2
Cephaloscyllium isabellum	CAR	69.3	28
Myliobatis tenuicaudatus	EGR	1	6.4
Callorhinchus milii	ELE	487.6	54
Torpedo fairchildi	ERA		
Hydrolagus spp.[1]	GSH	771.4	15
Hexanchus griseus	HEX		
Sphyrna zygaena	HHS	6	6.9
Isurus oxyrinchus	MAK	10.6	14.
Squalus mitsukurii	NDS	24.7	25.
Scymnodon plunketi	PLS		0
Lamna nasus	POS		0.8
Raja nasuta	RSK	212.9	27
Galeorhinus galeus	SCH	2137.1	20
Notorhynchus cepedianus[2]	SEV	1.1	0.8
Deania calcea	SND	183.6	3.6
Squalus acanthias	SPD	2831.6	56
Mustelus lenticulatus	SPO	1279.6	16
Raja innominata	SSK	390.5	47
Dasyatis spp.	STR/WRA	7.7	8.6
Alopias vulpinus	THR	8	16.
Deepwater dogfish	DWD	26.1	4.5
Other sharks and dogs	OSD	149.8	46
Shark unspecified	SHA	6	9
Shark fins	SHF	0.9	3.2
Skate[3]	SKA	963	92
	TOTAL	9699.6	13

Fisheries.

Year	Japan (Southern) catch	Japan (Southern) CPUE	Japan (northern) catch	Japan (northern) CPUE	Korea (northern) catch	Korea (northern) CPUE
1980	54286	2.13				
1981	40177	1.53			1196	1.12
1982	65218	2.72	29	0.2	523	1.11
1983	52059	3.34	241	2.52	94	0.13
1984	86100	7.14	1117	7.1	1761	1.5
1985	76703	6.92	4158	8.07	6922	3.36
1986	93158	8.18	8278	4.75	633	0.81
1987	88713	6.48	6772	3.39	2357	1.85
1988	94516	7.98	4966	6.24	1763	0.94
1989	64078	8.17	1181	5.94	152	0.42
1990	44512	7.91	6679	5.55		
1991	7295	0.64	1076	2.26		
1992	4508	0.61				
1993						

Table 4. Mako shark catch and catch rate (number/1000 hooks) by foreign longliners in the New Zealand EEZ. Source T. Murray and H. Dean, MAF Fisheries.

Year	Japan (Southern) catch	Japan (Southern) CPUE	Japan (northern) catch	Japan (northern) CPUE	Korea (northern) catch	Korea (northern) CPUE
1980	4524	0.19				
1981	2077	0.08			554	0.5
1982	2681	0.11	230	1.59	305	0.68
1983	7073	0.45	264	2.75	63	0.09
1984	4064	0.33	254	1.62	507	0.4
1985	1630	0.14	794	1.54	688	0.34
1986	1752	0.15	1643	0.94	275	0.34
1987	1689	0.12	2054	0.02	429	0.32
1988	2884	0.24	710	0.88	647	0.3
1989	745	0.09	320	1.59	160	0.5
1990	542	0.09	835	0.69		
1991	985	0.09	615	1.27		
1992	1838	0.24				
1993						

shark and porbeagle shark caught by observed longline o
New Zealand Exclusive Economic Zone (EEZ) from 198
Source: Information provided by New Zealand to 1995 C

Fishery	Blue shark	M sh
Japanese tuna longline targeting bigeye above 38° S	6.12	1
Japanese tuna longline targeting SBT above 38° S	15.55	0
Domestic tuna longline targeting bigeye above 38° S	21.03	1
Japanese tuna longline targeting SBT below 38° S	6	0
Domestic tuna longline targeting SBT below 38° S	7.03	

Table 6. Landed catch from New Zealand big game fishing records.
Source M. Francis, MAF Fisheries.

Year	Mako	Hammer	Thresher	Blue	Bronze whaler	other	total
1978	577	120	18			16	731
1979	776	147	8			5	936
1980	572	113	7			196	888
1981	775	113	17	328	15		1248
1982	680	89	8	170	4		951
1983							
1984							
1985	638	119	3	284	13		1057
1986							
1987							
1988	413	51	14	313	5		796
1989	476	84	21	306	14		901
1990	365	68	18	227	12		690
1991	414	57	28	127	10		636
1992	270	41	5	143	9		468
1993							

Table 7. Landings and export 1990 - 1995. Landings for fishing year (October 1 to September 30) compared to export from calender year for the three quota managed species.

	Elephantfish			School shark			Rig		
Year	landed	exported	% exported	landed	exported	% exported	landed	exported	% exported
1990	512	30	5.6	2386	257	10.8	1514	330	21.8
1991	553	27	4.9	2214	375	16.9	1466	296	20.2
1992	587	24	4.1	2479	368	14.8	1763	354	20.1
1993	607	2	0.3	2840	338	11.9	1650	275	16.7
1994	567	16	2.8	2603	552	21.2	1620	361	22.3
1995	683	14	2.1	2530	407	16.1	1758	358	20.4

Table 8. Quantity and value of shark fins imported to Hong Kong and Singapore from New Zealand. Source Hong Kong and Singapore trade statistics, Imports and Exports.

	Hong Kong Imports		Singapore imports	
Year	Qty (kg)	Value HK$	Qty (kg)	Value SS
1988	978	179662		
1989	203	126260		
1990				
1991	1533	628617	11000	303000
1992	1126	1034000	14000	486000
1993			12000	563000
1994	404	389000		

NB. Where figures are missing no data was available.

ports of shark into New Zealand by year and source country. Source: Statistics New Zealand, Overseas Trade.

Country	Aust		Japan		Malaysia		China		Taiwan	
	Qty	Value	Qty	Value	Qty	Value	Qty	Value	Qty	Value
other sharks, frozen	100	317	248	239						
other sharks, fresh or chilled										
, fillets, frozen					500	1390				
other sharks, frozen			250	2099						
other sharks, fresh or chilled										
, fillets, frozen										
other sharks, frozen										
other sharks, fresh or chilled										
, fillets, frozen										

Peter Matthew

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ovince of the Solomon Islands includes the islands of Gizo, New Georgia, Simbo, Ranongga, Shortland Islands, Vella Lavella, Vangunu and numerous small islands. It also includes a variety ous, ethnic, and language groups.

s greatly increased over the last 5 years due to the rapid price rise of dried shark fin which is mar- item to the Chinese in Singapore and Hong Kong.

people settled in the Solomon Islands in the 1960s as a result of the British colonial system, and urce depletion and population increase. The Gilbertese people are very much sea people. At n fish and coconut they avoid gardening. In the sea they are fearless and think nothing of ight for hours on end. These are the shark fishermen of the Solomon Islands although some ticipate because of the high prices. In order to collect information on shark fishing in the it was therefore necessary to look closely at the Gilbertese communities.

ains information that has been gathered using time honoured techniques in the Solomon Islands d interviews, community meetings, set questionnaires, and informal discussions. The latter were ange of settings whether it be on the back deck of a ship, at a market place, in a shop, or in a ng house. In the Solomon Islands it is a fact that most people love to talk and warm to the sub- tial introductions are concluded.

shermen has inherent problems. Often they are suspicious and jealously guard much information places, special gear, techniques and catch sizes. People who look official and carry amounts of ed or treated with disdain. Similarly conservationists are viewed with suspicion.

one week was spent in Marovo Lagoon interviewing Melanesian people and discussing the shark fin industry with some members of the World Wide Fund for Nature (WWF) ource Conservation and Development (WWF CRCD) field team. The remainder of the field trip y with the Gilbertese people in the villages of Nusabaruku, Titiana, New Madra, Komalai, a, and Noro.

s restricted to the Western Province and therefore has not dealt with the shark worshipping areas Makira, nor has the large Gilbertese community of Wagina in Choiseul Province been visited.

of inter marriage it has been possible to sample much of the diverse Solomon Island cultural, c groups while moving about the Western Province. This includes Melanesian, Micronesian and le.

There are three main methods of shark fishing as done by the local village fish

Handlining is done from dugout canoes that are paddled to the fishing site. T ment with wire traces and shark hooks that are baited with a variety of baits. school of bonito, the canoe floats while the fisherman baits the line then thro or rattle is shaken to attract the sharks. When the shark takes the bait the fis and then pulls it in. There is a lot of "technique" to this method but it is a me

Floaters may be anchored if the fishing site is close to shore as is often the cas just float with the current near the rafts. In the latter case the "floater" consis light nylon rope of about 7 metres, a heavy swivel, a stout wire trace and then thrown into the water up current of the raft. The rattle is shaken and the can trolling for other fish. In some cases 4 or 5 floaters will be attached to each ot a short "longline". Where this happens the ends of the "longline" are anchore

The nets are much more limited in abundance. A fisherman will set a net at d nets are about 6 or 7 inch mesh size and of varying lengths. Only 4 fishermen

A traditional Gilbertese fishing method involved a hidden way of calling the s string is tightly wound while at the same time an incantation is spoken. The i time as the string winding is completed. This will bring good luck to the fishe

In Tikopia, a remote Polynesian out lying island in the Temotu province, the using rattles made of coconut shells and other means. The sharks that come cl ing frenzy. The boiling breadfruit is then thrown into the frenzied sharks whic

Bait for floaters and handlines is mostly cut fish that has been freshly caught. cuttlefish.

The fishing methods outlined are stone age when compared with the methods shark fisheries such as exist in Australia where very long lines, gillnets and dr

Processing

The shark fins are usually sold to the buyers as a set comprising the first dorsal dal fin. The size is measured on the pectoral fin. In some larger sharks such as However in the Solomons there is no difference in price paid for select specie There are however several species of shark which are not bought such as sleepi

The processing of shark fin is fairly straight forward. The fins are scrubbed clea then the fins are sun dried and stored in a dry place.

Skin of the shark is considered excellent eating. You must leave a little meat o finally sun dried or smoked. At this stage it is preserved and can last a long tim time and have the denticles rubbed off. Finally it is "souped" (cooked in a pot taken by some buyers in the past but there is no longer any evidence of this.

The stomach is treated similarly to the skin. The gills are boiled and eaten. T

…now to prepare a "special" food for the old people with no teeth. This was done long ago in the …before the coming of the English and the church. The shark meat was boiled and then dried. It …d into a tight ball and put into a coconut shell. The coconut shell was wrapped well to keep the …en hung in the kitchen for 3-4 weeks. The meat gets a "special worm" [perhaps a parasite that …after a time]. The old people wait till night and then open the coconut, throw away the meat but … which are numerous. The old folk like this very much but don't do it any more: "health has …stom has gone".

…rom the Gilbert Islands was that the young boys were forbidden to eat fish in the day time only …allowed. This was so that the young boys would become like the sharks: fearless warriors.

…blished market for the meat in the larger towns of Honiara or Gizo.

…e is very little shark fishing carried out by the village people. Perhaps 3 or 4 fishermen in a village … make a token effort at shark fishing but these are not serious shark fishermen. The statistics …Seghe based fishing project give an indication of the commitment to shark fishing.

…ll group of Gilbertese who established a camp on the island of Baharo in the Hele Island chain …ovo Lagoon. They were primarily engaged in beche-de-mer *(Holotheria spp)* and shark fishing …ave since left.

…say that there is no taboo for catching sharks or eating the meat. However most people just do …ne meat Rays are a little different because some people that do not eat shark will eat ray. … one in Marovo caught or ate shark. There is however a superstitious feeling about sharks that is …st Melanesian people. This feeling is exemplified by the following story that supposedly happened

…n a canoe between Hele Islands and Vangunu. A big wind came which whipped up huge waves …nk. He thought that he was finished but called out to a shark who came and let him hold onto …e shark took him back to Vangunu and so the shark is a special friend."

…mporary stories that strengthen this feeling.

…eliberately fish for sharks, you make yourself safer. If you are fishing and the canoe capsizes sharks …" … a Marovo woman.

…arovo have tried their hands at different enterprises. They tried shark fishing but other people in …l them to stop because they were going against an old taboo. They kept fishing but noticed that …tarted things had changed. A dog from the village was taken by a shark. One person became ill. …raight at a spearfisherman instead of just taking the fish. They were told to stop by relatives and …They stopped and although during the 6 weeks that they persevered they made quite a lot of …l that they were glad to have stopped.

…arovo used to fish for sharks until he had a bad experience. He was fishing with his young son …y hooked a large shark. He is not a very strong man and it was hard to pull the shark into the …ately the shark was not dead and started to thrash about. The canoe rocked and his son nearly …

passage it was forbidden to even fish. When lotu (church) came, devils were … not kill sharks nor eat the meat."

One story from Marovo says that there is a taboo on targeting sharks. If a shar… should be cut and the shark released. In the event of the shark dying, the bo… shark took part of a fish, the fisherman should throw away the remainder and … something bad. Another version of this story is that if a special pandanus leaf … leaf is used to scratch the remainder then it is safe to eat.

Results from the Questionnaires

Titiana

Titiana is the biggest Gilbertese community on Gizo Island. It has a populatio… religion is United. There are about 13 shark fishermen.

The fishermen are all in their 30s and they are very good fishermen with best … The average catch was estimated by the fishermen to be 2-3 sharks per day. T… skins but also for the meat, skin and teeth.

The fishermen all have boats with engines enabling them to go to the rafts ar…

The fishing effort results gave an average fuel usage of 35-40 litres a day. An a… hours away from home. 5 floaters per canoe was the average.

There was some disagreement as to the season. February to August was one po… June to November. The new or full moon times were universally chosen as th…

Everyone interviewed put shark fin as financially of top importance.

Women are involved in the salting and drying of the fins.

Nusabaruku

Nusabaruku is a Gilbertese community of about 200 people located across Giz…

Occupations include shopkeepers, public officials and fisherman. There are 2 …

The best catches reported by fisherman were 4-5 sharks in a day with the aver…

Fishing effort information is 40 litres of fuel for an average day to the rafts, spendin…

The best season for sharks was said to be June - August.

Women are involved in the processing.

Laumana

Laumana, Harapa, and Komalai are all located on the isolated northern side o…

Laumana is a small Gilbertese village of about 100 people with 13 fishermen …

Most fishermen just look for schools of bonito or flocks of birds and paddle o…

ormation relevant to fishing with an engine. 10 litres of fuel for a 6 hour trip and using 3

ainly sold in Gizo to Paro Corp.

shark are used except the intestines. The liver oil is not separated but the liver is eaten.

processing and cooking. It is a lot of work for the women because sharks are the main food.

ns are June, July, and August around the new moon but sharks can be taken at any time.

hortland Island villages, transport is difficult and although there is a buyer in one of the other vil-
ld in Gizo. People have noticed that the shark numbers have reduced a little but not much. The
rtant but it is sporadic, costly and difficult to get the product to the market. One fisherman said
ing industry could be controlled if it is kept small but ships spoil it".

bertese village of 220 people. There are 8 fishermen one of whom is a woman. She is the youngest
old and the oldest is 53 years old, most however are in their 30s.

sharks are used except for the intestines, the meat forming the major part of the diet.

nd handlines are used. They look for birds and bonito when choosing where to fish. There are
nes and so the others just paddle.

nformation: 20 to 26 litres of fuel for a 6 to 8 hour trip using an average of 2 floaters.

was 7 sharks by a fisherman with an engine who usually takes another 2 people with him. Mostly
was 3-5 with the average catch being 1- 2 sharks for a trip.

ple interviewed said that any month was good and fishing best around the full or new moon.
t April to November was the season with June and August being the best months. Two people said
of the moon is the best.

olved at every stage with one woman actually fishing. Other fishermen said that their wives would
ring the bell (tekawaruaru) to attract sharks or sometimes they would hold the handline.
ld be done together.

estionnaire participants have noticed that shark size and numbers have decreased and have
t is because of fishing. Others however have not noticed any change.

was interviewed. He had noticed that his last year of buying, 1994, was the best with 20 kg. of
bruary and 20 kg. in August. His observation was that the money was important for buying food ie.
f rice, flour, biscuits and noodles but that people survived well without these so it was not very

lbertese community of about 200 people. There are 12 shark fishermen in Komalai and one buyer.

man was interviewed here but his answers echoed those of the fishermen in Laumana. His best
harks but he told of a Komalai fisherman who took 10 sharks in one night using a net.

man will go out to the rafts and troll for other species as well. If there are fi
shark bait, fish for the market and shark. He will be constantly vigilant for th
signs of bonito activity. On a good day he will have bonito and yellowfin tun
as well as shark fins.

Many Gilbertese believe that it is bad to throw away shark meat because it is
Gilbertese. However there is a practical consideration due to the small size o
with sharks and the money involved. Many fishermen now dump the shark

As with the other Gilbertese communities, fishermen say that the shark teet
traditional Gilbertese fighting sword which features shark teeth lashed to bo
end. Warriors would wear a dried porcupine fish skin helmet and wield a tere
the hearts of the opponents. Today, these terere are made as house decoratio
were observed during this study. Obviously teeth are not a main concern in t

On an average of 40 litres for a fishing trip a Gizo fisherman needs US$84 ju
replacement are other ongoing costs. If it is assumed that an average catch is
age one shark yields 0.5 kg 1st grade fin then the return is US$95 giving a pr
not much when a 20 kg bag of rice is US$37. On a good trip taking 5 sharks
US$80 for fuel giving a profit of US$395 which is a lot of money.

The stated season was February to August but if the buyer records are consid
must be good as well.

All the Gilbertese fishermen have stories of the NFD (National Fisheries De
taking big catches of sharks. They similarly have noticed a decline in the nu
management or conservation of shark resources is restricted to stopping these
the local fishermen. When talking to these fishermen they say that they just
lots of sharks and then sell them easily. After considering for a time or perha
that management may be necessary. At the moment the control is remotenes
of marketing.

Ranongga

There are many Seventh Day Adventists on Ranongga Island. This religious
standing part of the shark fin industry. Sharks are understood to be "fish with
Seventh Day Adventists to eat, touch or sell. However, this seems to be subje
many Seventh Day Adventists don't like to talk about religious taboos when
income. Seventh Day Adventists are Melanesians. They definitely do not eat
are used in carvings and there are an increasing number of Seventh Day Adv
of the lure of the dollar. Women are definitely not involved in any aspect of t

By comparison with the Gilbertese from Gizo these Melanesian fishermen are
a best catch of 3 sharks in a day. They have no knowledge of seasons, phases
decline in shark numbers although they fish in exactly the same areas.

The fishing effort information showed that an average fishing trip used 10 litr
hours and only used 3 floaters.

The one Seventh Day Adventist fisherman who was interviewed

s. The coming of the church has changed this belief on the surface but there is still worship of ief in magic. Most Malaitans do not eat shark meat nor fish for sharks. One Malaitan who lived in at he did fish for sharks but that he did not eat the meat. He had adopted many of the Gilbertese n participated in Gilbertese dancing. He said that Malaitans "don't eat shark meat because sharks and that in parts of Malaita sharks are worshipped as God.

ople of Sikaiana, Ontong Java and the eastern Reef Islands do catch shark and eat the meat.

A day in the life of a shark fisherman.

The sound of muffled talking wakes me at 3.35 am. Wayunnnga has already boiled water and prepared rations for the early morning trip. Two young girls had made the canoe ready the night before, loading floaters, ropes, and other equipment before turning the canoe around in the narrow berth. We are in a small leaf house located amongst the mangroves at one end of Gizo harbour.

A battered plastic fish basket full of fishing gear is dragged out and final additions put in. At 4.10 am we set out and motor through the main passage and into the open sea. Despite the moon (full moon was 5 days ago) it is dark and we steer by compass. A steady breeze accompanies us to our destination which is a small bamboo raft some 15 miles distant. After an hour we change direction and using just visible landmarks have no problem in finding the raft. These rafts have been put in by the Solomon Taiyo tuna fishing company and are also known by the acronym FAD or Fish Aggregating Device.

Some birds are starting to chase small bait fish as we put our trolling lines into the water. A mere 3 minutes later we take a 5 kg. barracuda. Mekaio cuts the fish in two and baits the first floater. A second floater with a smaller circle hook is baited with another quarter. He lowers the baited hook which is tied onto about 1.5 metres of stout wire cable. Next comes a swivel, 15 m of 6 mm rope and finally the floaters (2 buoys of 0.3 metre diameter). Now is the time to shake the rattle or Tekawaruaru - custom bell or rattle to attract sharks. It comprises an iron hoop attached to a handle and threaded with coconut shells and tuna tins.

We see a small shark approach the bait and I shout out but it is taboo to point. Mekaio did this once as a lad and received a sharp slap with a paddle as a reward from his father. After a little time we try to take some bonito but without success. Half an hour later we retrieve the two floaters and then set off for a second raft and then a third. Alas only one small shark is taken for the day but it is too small and is thrown back. The sun is hot when we see some other

...llowing list has been compiled from prices in Gizo.

Item		Cost (US$)
Fibreglass canoe		6000.00
Engine	15 HP	5900.00
Floaters	3@ $117.00	351.00
Rope	1 coil	35.00
Wire		6.00
Hooks	3 @ $18.00	54.00
Troll lines	2 @ $15.00	30.00
Compass		100.00
Bush knife		19.30
Shark clips	3 @ $25.00	75.00
Knife	good stainless steel	45.90
Squids	2 @ $5	10.00
Custom bell	Tekawaruaru	
TOTAL		**12,626.20**

The above is all new gear but many items are acquired or bought second han from dive sites or Taiyo buoys. Hooks vary in price from US$6.00 to US$35.0

Taiyo

In the Western Province the shark fishery is intrinsically tied up with the Sol which has a fishing base and canning factory in the town of Noro, New Geor workers and fishermen. Taiyo have installed all the FADS or rafts and consid rafts near Gizo. The fishermen have been affected because they say that all th rafts and away from the islands. With the bonito go the bigger fish like yellow very difficult to take a good catch of bonito or shark with...

nd the other closer to Vella but they are too far from the Shortlands and are fished by people

have expressed the view that they should cut loose the rafts but this could be partly due to ween Japanese Taiyo skippers and locals. One fisherman was allegedly chased and threatened by a lot all of the skippers are Japanese. There are 18 pole and line boats and one purse seiner. Each at has a skipper and a fishing master. There are only six Solomon Island skippers. Now officially ed taking shark fin and if there is a Japanese skipper they stand by that rule, but in the case of the crew may be able to do some shark fishing. " If the boys have been catching well and if there are und then they might get half an hour or an hour to catch some sharks before the boat moves off " The bycatch of this pole and line fishery are yellowfin and rainbow runners. This will be sold rket but the proceeds do not go to the crew. Only the shark fin is sold for private pocket money mbers. According to two pole and line fishermen who were returning home for Christmas you u caught 5 sharks in a day. Only the fins are saved with the remainder being dumped at sea.

e seiner works all the year round concentrating on the FADS. This boat is prohibited from fishing but that does not stop the skippers. Anecdotal evidence has it that the purse seiner often fishes in rs. It also takes lots of sharks which are finned and then dumped. One reliable source said that the l recently sold a large amount of shark fin in Honiara.

ting factor is that the fishing method of using "floaters" has been made possible by the extensive the company and the "liberating" of these floaters by the fishermen.

levels of buyers: the unlicensed rural village buyers, the licensed provincial buyers, and the big ra. For the local people it is much better to sell direct to the Honiara buyers but this is difficult . In the past the Honiara buyers had more of a monopoly but now they appear to be prepared to ps handle the rural fishermen. This possibly reflects the relative importance of the rural industry big suppliers. Certainly the declared 745 kg. of dried shark fin from 3 buyers in the Western op in the ocean for the nation. With the extremely high monetary value of sharkfin it is likely rs seek every opportunity not to declare quantities bought and sold ie. to buy and sell on the

mmercial shark fishing operations in the Solomon Islands.

small buyers including several villagers, a Malaysian in Noro, and a trading boat operator, and uys beche-de-mer also buys sharkfin.

e are two buyers of shark fin. One merchant at Warata Island and the E.C. fishing project operat- ghe Fisheries station. Evidently a Chinese ship that was buying live fish was also buying shark fin been verified. The merchant on Warata buys small reef shark fins from the locals but not much. n the Taiyo boats and the Essa (bait fishing dories associated with Taiyo) boat boys. The hat most of the fins are of the 3rd or 4th grade.

1st grade	above 12"	US$125.00.
2nd	8"-12"	US$ 90.00
3rd	6"-8"	US$ 45.00
4th	4"-6"	US$ 22.00

From November 1994 to November 1995 this group bought a total of 33.76 k

Western Fishermen's Co-op

The Western Fishermen's Co-op, located on the Gizo waterfront, has over 30 fishermen and offers reduced prices on fuel and tackle for members. The man see restrictions placed on local fishermen.

Western Fishermen's Coop (WFC) buys from all over the Western Province - Simbo, Shortlands, New Georgia, Gizo, Rendova, and Ranongga. It is import doing the buying was from Ranongga.

The prices offered have changed a little over the year in response to some co they were:

1st grade	above 12"	US$184.00
2nd	8"-12"	US$128.00
3rd	6"-8"	US$ 64.00
4th	4"-6"	US$ 24.00

A summary of 1995 shows that a total of 287.62 kg of dried shark fin was purc was 1st grade.

Month	1st Grade	2nd Grade	3rd Grade
Jan	1.55	1.50	0.10
Feb	11.95	3.90	0.40
Mar	13.30	6.20	3.45
Apr	11.20	3.75	2.15
May	22.30	3.60	0.65
Jun	21.30	2.40	0.70
July	18.80	7.10	0.55
Aug	5.35	4.25	1.10
Sept	14.85	5.95	1.80

icating that possibly fin sets from one shark weigh 0.5 kg. dried.

ration

ation began operating in August 1995 after taking over from Barava Enterprises as one of the two rine products in Gizo. The figures obtained are much more basic than from WFC but show the total e August.

ove 12"	US$190.00	US$56.05	344.4 kg.
-12"	US$120.00	US$35.40	57.0 kg.
8"	US$ 35.00	US$10.32	17.5 kg.
6"	US$15.00	US$4.42	5.1 kg.

ned then the 207 kg. dried fins for the twelve month period represents 414 sharks. Applying these o Grant's figures since August, yields an estimated 689 large sharks taken. Coupled with WFC ugust a total of 450.6 kg of dried 1st grade fins and so 902 sharks.

g to note that in the entire Western Province there are only three shark fin buying licences and n Gizo. That is to say that all the small buyers on the other islands operate without licences. The nce has no restriction on the number of licences the implication being that the licences are purely her than as a management tool. A beche-de-mer buying licence costs US$ 295 per annum and a licence costs US$ 737.46 per annum.

ased company is the major buyer of shark fin and other marine products such as beche-de-mer, the Solomon Islands. There are only a couple of other buyers in Honiara but these are small by oth of the official shark fin buyers in Gizo subsequently sell to Sun King in Honiara making an rk up for their trouble and freight.

o send a boat to fish in the Shortland Islands but the chiefs did not like this. "Let the locals fish". e when they sent a buying boat but this also has stopped. A small trading boat was also operating topped. Shark fin from the Shortland Islands is taken to Gizo or Honiara. Indeed if a fisherman going to Honiara he will try to save his shark fin and sell direct to Sun King because of the bet- er these trips to the capital cost quite a lot in time and money and so do not happen very often.

rs

stablished diving resort in Marovo Lagoon (Uipi) but the managers are changed every 2 years ot have any feel for the changes in the areas dived.

ve operations operating in Gizo but due to the staff turnover at the Gizo Hotel the only reliable ration is Adventure Sport, Gizo.

was born in Florida and has been diving since he was 15 years old. He and his wife Kerry have Gizo for 11 years and Danny has clocked up over 10,000 dives.

... His perception is that the overall size and density of fish is reduced

Shark fishermen regularly operate near one of his dive sites and the only r

As far as Danny knows there is no history of purse seiners operating in the boats do. The rafts have been in the area for about 5-6 years.

Danny believes that it is in the interest of tourism and dive operators to en like to see detailed management of the marine resources including a monit been of great assistance in this preliminary study and will continue to assist

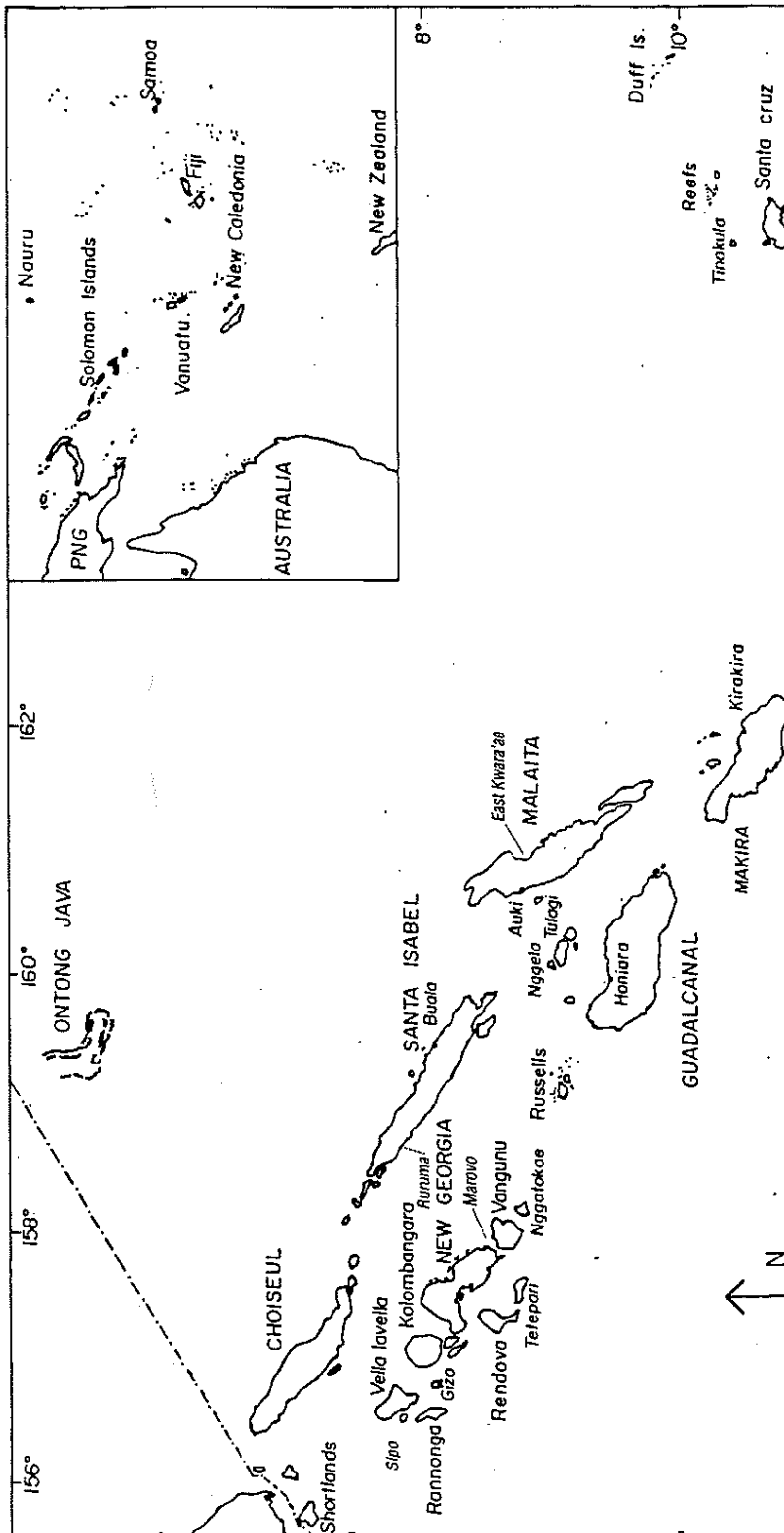
Recommendations

1. Investigation of the large scale bycatch of sharks should be undertaken the numbers and species taken by purse seiners and long liners.
2. Investigation of the illegal ie undeclared export of shark fin from the S monitoring the unloading of catches from tuna seiners to other ships o
3. An extensive education and conservation awareness program be emba community in the Solomon Islands.
4. A long term look at the rural shark fishing industry should be undertak taken and monitoring any changes in the amounts of the different size

...NAIRE FOR SHARK FISHERMEN

...sh for shark?
...at the meat?
...se any parts other than the fins? - eg. Oil, teeth, skin.
...thods do you use? Net, Floaters, Handlines.
...o you fish?
... you fish -what months (season)?
-what phase of the moon?
...y people go in each canoe?
...y sharks and kg. In your best catch?
...y sharks and kg. In an average catch?
...you sell to?
...ortant is the income from sharkfin to the community?
...rtance, 2nd, 3rd, 4th.
...fort. On an average day, how many: -litres of fuel are used?
-hours are spent?
-floaters are used?
...e product processed?
...en involved at any stage?
... seen or heard of large catches of sharks by companies?
... noticed any change in shark numbers over time? Any ideas why?
...ave any ideas for shark conservation and management?
... any custom stories or taboos concerning sharks?
...now of any historical uses of shark products?
...nything else that you would like to say concerning sharks?

Map of Solomon Islands



The TRAFFIC Network is the world's largest wildlife trade monitoring programme with offices covering most parts of the world. TRAFFIC is a programme of WWF (World Wide Fund for Nature) and IUCN (The World Conservation Union) established to monitor trade in wild plants and animals. It works in close co-operation with the Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

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