



Department of
Primary Industries and
Regional Development

Research Library

Fisheries management papers

Fisheries Research

4-1986

The report of the southern Western Australian Shark working group.

P. Millington

Follow this and additional works at: https://researchlibrary.agric.wa.gov.au/fr_fmp



Part of the [Aquaculture and Fisheries Commons](#), [Natural Resources and Conservation Commons](#), and the [Population Biology Commons](#)

Recommended Citation

Millington, P. (1986), *The report of the southern Western Australian Shark working group.*. Fisheries Department Perth Western Australia., Perth. Report No. 1.

This report is brought to you for free and open access by the Fisheries Research at Research Library. It has been accepted for inclusion in Fisheries management papers by an authorized administrator of Research Library. For more information, please contact library@dpird.wa.gov.au.

FISHERIES MANAGEMENT PAPER

No. 1

THE REPORT OF THE SOUTHERN WESTERN AUSTRALIAN SHARK WORKING GROUP

BY THE

CHAIRMAN MR P. MILLINGTON

TO THE

MINISTER FOR FISHERIES, THE HON J. F. GRILL



**FISHERIES DEPARTMENT
PERTH WESTERN AUSTRALIA
108, Adelaide Terrace, Perth 6000.**

NOVEMBER 1986



THE SOUTHERN WESTERN AUSTRALIAN SHARK WORKING GROUP

REPORT BY THE

CHAIRMAN MR P MILLINGTON

TO THE

MINISTER FOR FISHERIES, THE HON J F GRILL

FISHERIES MANAGEMENT PAPER NO. 1

NOVEMBER 1986

FISHERIES DEPARTMENT
108 Adelaide Terrace, Perth 6000

HON MINISTER FOR FISHERIES

I have pleasure in forwarding to you the report of the southern Western Australian Shark Working Group, in accordance with your terms of reference dated 5 September 1985.

P Millington

P J Millington
CHAIRMAN

30 October 1986

CONTENTS

| | PAGE NUMBER |
|--|-------------|
| 1. EXECUTIVE SUMMARY | 1 |
| 2. SUMMARY OF RECOMMENDATIONS | 3 |
| 3. INTRODUCTION | 9 |
| 4. DESCRIPTION OF FISHERY | 12 |
| 5. STATUS OF THE SOUTH COAST SHARK FISHERY | 14 |
| 6. MANAGEMENT PROPOSALS | 19 |
| 6.1 Vessel Access | 19 |
| 6.2 Species | 19 |
| 6.3 Boundaries of the Limited Entry Area | 21 |
| 6.4 Mesh size limits | 23 |
| 6.5 Criteria for entry | 26 |
| 6.6 Allocation of Time and Gear Entitlements | 29 |
| 6.6.1 Allocation of Time Entitlements | 29 |
| 6.6.2 Allocation of Gear Entitlements | 32 |
| 6.7 Transferability of Time/Gear Entitlements | 36 |
| 6.8 Nomination of Time Access Entitlement | 39 |
| 6.9 Joint Holdings of Hook and Net Gear Entitlements | 40 |
| 6.10 Transferability of Shark Entitlements | 41 |
| 6.11 Supplementary Access | 41 |
| 6.12 Zoning Restrictions | 44 |
| 6.13 Reduction of Fishing Capacity | 46 |
| 6.14 Structure of Management Body | 51 |
| 6.15 Enforcement and Surveillance | 52 |
| 6.16 Additional Controls on Gear Specification | 54 |
| 6.17 Penalties | 55 |
| 6.18 Cost of Management | 56 |
| 6.19 Appeals | 57 |
| 6.20 Ministerial Discretion | 58 |
| 6.21 Legislative Action | 59 |
| 6.22 Recreational Fishermen | 60 |
| 7. ACKNOWLEDGEMENTS | 61 |
| Appendix 1 | 62 |
| Appendix 2 | 65 |

1. EXECUTIVE SUMMARY

The southern Western Australian Shark Working Group was formed to investigate the southern shark fishery and advise the Minister for Fisheries on options for future management. Membership comprised six fishermen from regional professional fishermen's associations and two Fisheries Department officers.

There has been a considerable increase in effort in this fishery in recent years, especially with gill nets, which now catch over 90% of the total landings. The total catch has not increased significantly in this period, so catch rates have been declining. Individual fishermen are thus being forced to deploy more net to maintain their catch share. There is also some cause for concern over the state of the shark stocks.

The Working Group has proposed to the Minister for Fisheries that a Limited Entry regime be introduced for the southern shark fishery. Eligibility for entry to the fishery should be based on a history of fishing for shark in the area prior to the bench mark date of April 30, 1985 and a minimum tonnage taken in the three years prior to this. The tonnage is set at a level such that all but occasional shark fishermen or recent entrants to the fishery will gain an entitlement to fish.

A feature of this fishery is the relatively small number of full time shark vessels, which catch the majority of the shark, and the large number of vessels which catch shark occasionally, as part of an overall fishing strategy. The Working Group recognized that the full time shark fishermen have been the major cause of the increased effort in the fishery and must bear the greatest proportion of any effort restrictions. However the Working Group also wished to ensure that while this was done, the remainder of the fishermen were not given the opportunity to increase their levels of effort at the expense of full time fishermen.

To this end the Working Group considered that each shark fisherman obtaining an entitlement should then be restricted in the length of fishing gear he can use and the number of months he can fish. The individual's time and gear entitlement would be approximately that length of gear being used and time spent fishing in a period shortly before the bench mark date. To give more flexibility a fisherman should be allowed to nominate, at short notice, the particular month(s) he wishes to fish. These entitlements should be fully transferable.

To ensure the minimum disruption to their activities supplementary access has also been proposed for fishermen who occasionally fish for shark.

Measures to further reduce total effort to a level similar to that at the benchmark date and to compensate

for increases in efficiency have been proposed. Other recommendations are measures to ensure that gill net mesh sizes do not continue to decrease, that the trend to increasingly deep nets is arrested and that there is not a large geographical redistribution of effort in the early stages of management. Various methods to assist fisheries officers ensure compliance with time/gear entitlements are outlined as is the appeal process for those not gaining access or disputing the time/gear entitlements initially allocated.

The Working Group also recommend the formation of a management advisory committee to provide advice to the Minister for Fisheries on the management of this fishery.

2. SUMMARY OF RECOMMENDATIONS

1. That the southern Western Australian shark fishery be declared to be a Limited Entry Fishery.
2. That the Limited Entry Fishery relate to the taking of all shark and scale fish by the methods of demersal gill mesh nets and demersal longlines.
3. (a) That the area of the fishery be defined to include all waters to the boundary of the Australian Fishing Zone below high water mark encompassing both State and Commonwealth waters between the South Australian-Western Australian Border and 33° south latitude on the west coast of Western Australia.

(b) That buffer areas be established for waters between 33° south latitude and Cape Bouvard and separately at the South Australian-Western Australian border to take account of the supplementary access entitlement of fishermen who have fished in these areas, without providing full access entitlement to the southern Western Australian shark fishery. This access entitlement is to be non-transferable and reviewed annually.

(c) That catch and effort from the shark fishery north of 33° latitude be monitored by the Fisheries Department.
4. (a) That a minimum mesh size restriction of 17.5cm (7" mesh) be introduced for all shark gill net used in waters east of Clifty Head.

(b) That a minimum mesh size restriction of 16.25 cm (6½" mesh) be introduced for all shark gill net used in waters west of Clifty Head.

(c) That fishermen historically using smaller mesh gear than that being recommended for use in the above areas, be registered with the Fisheries Department and permitted to use the smaller gear until January 1, 1989 or until such time that the gear reaches the end of its economic life, whichever is the sooner.

(d) That it be noted that the Working Group support further examination of the effect of using 6½" mesh rather than 7" mesh in areas west of Clifty Head to determine if this will enhance conservation of whiskery shark stocks.
5. That the following set of criteria be applied for entry to the southern Western Australian shark fishery.

The holders of a Commonwealth boat licence or Western Australian fishing boat licence may apply for endorsement of their licence to allow a boat to be used for gill netting (*)(**) of shark in all Western Australian and Commonwealth waters below high water mark which are west of 129° east longitude and south of 33° south latitude, provided the following conditions are met:-

(a) The boat to which the licence applies has been used to take shark at some time during the period commencing May 1, 1982 to April 30, 1985;

and

(b) The average annual shark catch within the area of the fishery during this period since commencing to fish, has been two or more tonnes landed weight, evidenced by catch and effort returns submitted prior to June 30, 1985;

and

(c) the owner of the boat can demonstrate a continuing commitment to and economic dependence on the shark fishery;

and

(d) if on or after April 30, 1982, a boat which satisfies the above conditions was sold as an operative fishing boat with the fishing licences transferred to a new licensee the fishing history would apply to the new licensee as if the current licensee was the original licence holder;

or

(e) if on or after April 30, 1982, a boat which satisfies the above conditions was replaced, the boat which was replaced will be deemed to have left the fishery, and

* For the purposes of definition, shark nets or gill nets are defined as monofilament mesh nets with a minimum mesh of 16.25 cm. (6½ inches).

** For the purposes of determination of access, the taking of shark by demersal longline may be taken into account by substituting the term longline in the place of gill nets.

only the replacement boat will be eligible for an authorization.

- (f) That no vessel access be granted outside the criteria stated in 5(a)-(e) inclusive unless through an appeals system.
- 6.
- (a) That any vessel once granted access under the entry criteria, to be unitised in time/gear month access units in accordance with historical levels of participation within the southern Western Australian shark fishery.
 - (b) That the level of time access be based on the maximum number of months fished productively for shark in any one year, during the three year period prior to April 30, 1985. For this purpose a year will be from May 1 to April 30.
 - (c) That gear used within the shark fishery be unitised and that the initial allocation of gear units for gill nets and longlines be based on the length of nets and/or number of hooks used by each vessel in accordance with the level of usage in the twelve months prior to April 30, 1985 or the last year fished to a maximum of 10 nets or 2000 hooks. (A gear unit will equate to 600 metres of gill mesh net i.e. the amount of hung net equating from a bundle of 1 000 yards or in the case of longline 200 hooks).
 - (d) That no time/gear access be granted outside the criteria stated in 6 (a) - (c) inclusive unless through an appeals system.
- 7.
- (a) That time/gear month access units be fully transferable with trading allowed down to half gear units (one half net unit will equate to 300 metres of gill mesh net, and one half hook unit will be 100 hooks).
 - (b) That the combination of time/gear access units be set for each authorization holder in accordance with their initial allocation. However, additional units purchased may be added in any combination of gear and time.
 - (c) That in the event of gear unit transfer there be a minimum holding of $3\frac{1}{2}$ gear units with a maximum holding of 14 gear units.
 - (d) That in the event of gear unit stripping (ie. a licensee transfers all of his gear entitlement) of a licenced shark vessel the endorsement for that vessel shall subsequently lapse.

8. (a) That shark entitlement holders nominate the months they wish to fish for shark in accordance with their time allocation in 6(a). Nomination may occur at any time throughout the year.
- (b) That shark gear shall not be carried on board the vessel for those months not nominated for shark fishing, unless alternative arrangements are made with the local Fisheries Officer.
9. That time/gear units for hooks and nets be not interchangeable. However, the question of relative catchability of hooks and nets should be kept under review so that a formula to interchange units can be considered at a later date.
10. That shark entitlements be fully transferable with changes in licence holding (ownership) for the authorized vessel.
11. (a) That all vessels not qualifying for a shark endorsement under (5) but with a historical involvement in the south coast shark fishery during the last ten years and still operating on the south coast be granted a supplementary access entitlement of up to 6 gear/month units in accordance with historical usage. This to be allocated as any combination of units.
- (b) That supplementary access be granted on application only.
- (c) That supplementary access be transferable if it constitutes an integral part of the fishing operation and if sold with the entire fishing unit.
- (d) That in the event of gear unit stripping of a licensed shark vessel, there be no supplementary access entitlement.
- (e) That this supplementary entitlement to remain unless it is shown that as a group, these fishermen are placing increasing pressure on shark resources to a point that a reduction of fishing effort becomes necessary.
12. (a) That vessels historically operating on either the south coast or the south-west coast should not be permitted to transfer their fishing activities and time/gear units from one zone to the other, in the initial stages of the management plan.
- (b) That there be a boundary at Chatham Island with boats limited to fishing from relevant anchorages each side of the line.

- (c) That buffer areas be established for waters between Windy Harbour and Point Irwin to take account of the access rights of, and mesh size used by, fishermen who have historically fished in these areas.
 - (d) That this restriction to apply for three years only.
- 13.
- (a) That a 10 percent reduction in gear units occur at the time of initial allocation.
 - (b) That the percentage reduction only occur down to a minimum of 3½ net units.
 - (c) That a two-for-one reduction of all time/gear units occur at the time of vessel or time/gear entitlement transfer. (ie 50%).
 - (d) That if the rate of vessel or time/gear entitlement transfer is not sufficient to reduce fishing capacity, further gear reductions may be introduced.
 - (e) That at this time, a specific boat replacement policy or buy back policy not be implemented for this fishery.
14. That following implementation of the management programme for the southern Western Australian shark fishery, an industry/government management advisory committee be established to provide management advice on the fishery.
- 15.
- (a) That controls on gear usage be achieved through the unitisation of net length and/or net volume for mesh nets and standardised line volume and hook numbers for longlines.
 - (b) That drum net volume or longline volume and hook numbers within standard containers be used as an enforcement aid on boats when in port, as a proxy for quantity of gear used by individual fishermen within the shark fishery.
 - (c) That the administration of time access as defined in 6(a) in the shark fishery be undertaken in the field, through delegated authority to Fisheries Field Enforcement Staff, at each of the major fishing ports within the fishery.
- 16.
- (a) That the depth of nets used within the shark fishery be limited to a maximum of 20 meshes.
 - (b) That in the event of an entitlement holder upgrading to more than 15 meshes deep there be a 20% reduction in gear units.

- (c) That in the event of vessel or time/gear entitlement transfer, mesh depth be 15 meshes.
17. (a) That any entitlement holder using more net than has been allocated to lose that extra length of net from the initial gear entitlement.
 - (b) That any entitlement holder fishing more months than has been allocated to lose those months from the initial time allocation.
 18. That an access fee equivalent to three quarters of one percent of the gross value of the shark fishery be charged as a licence fee on the establishment of the fishery as a Limited Entry Fishery.
 19. That an appeals committee be established to consider all appeals and provide advice to the Minister for Fisheries, on such appeals. The composition of the Appeals Committee to consist of at least two senior Fisheries Department officers and an independent person external to the Department.
 20. (a) That it be noted that the Minister has the authority to consider applications of a special nature on a case-by-case basis.
 - (b) That it be noted that the Minister may impose special conditions on some of the vessels holding authorizations.
 - (c) The Working Group request that the Minister pay due consideration to the access criteria in the event of appeal.
 - (d) That in the event of appeals the Working Group request that the Minister pay due consideration to those appellants having been involved in experimental or developmental fishing during the criteria period.
 21. That the southern Western Australian shark fishery be managed under the limited entry provisions of the Western Australian Fisheries Act through a Joint Management Authority under the Commonwealth - State Offshore Constitutional Settlement arrangements for fisheries administration.
 22. That it be recommended to the Recreational Fishing Council that there be a limit on the number of hooks to be used on a set line, and a maximum mesh size of 10 cm (4") to complement the existing minimum of 5.7 cm (2¼").

3. INTRODUCTION

On November 7, 1985, the Minister for Fisheries issued a press release which announced the formation of a joint Western Australian Government - Industry Southern Shark Fishery Working Group. This initiative followed representations from industry and the Western Australian Fishing Industry Council for the formation of such a group to examine and report on management options for the southern shark fishery.

The Minister in issuing the press release, warned fishermen against making further investment into the southern shark fishery and reminded fishermen that April 30, 1985 had been established as the benchmark date for future access into the Western Australian shark fishery. New entrants into the fishery after that date were advised that no guarantee could be given on future access, if decisions were taken to establish the shark fishery as a limited entry fishery.

The Working Group's terms of reference are:

- . Collate existing information including biological data on the shark fishery off the south coast from the South Australian-Western Australian border to just north of Bunbury.
- . Identify fishery management options taking into account the need for sustained rational exploitation of different shark stocks and the long term maintenance of a viable shark fishery.
- . To advise the Minister on future management arrangements for the southern Western Australian shark fishery.

The Working Group was subsequently established with the following membership.

Chairman Mr P Rogers
 Mr P Millington took over as
 Chairman on 22 July 1986

Members Mr J Lilburne (Fisheries Department)
 Mr M McKenzie (Displaced tuna
 fisherman-Esperance)
 Mr B Bubb (Esperance Professional
 Fishermen's Association)
 Mr A Sharpe (South Coast Licensed
 Professional Fishermen's Association)
 Mr G Peters (W A Tuna Boat Owners
 Association)
 Mr R Cooley (S W Licensed Professional
 Fishermen's Association Augusta
 Branch)
 Mr N Soulos (S W Licensed Professional
 Fishermen's Association Bunbury
 Branch)

Messrs R Green and C Ostle attended as deputies to Messrs G Peters and J Lilburne.

Technical biological advice was provided by Mr R Lenanton and Mr D Heald from the Western Australian Marine Research Laboratories.

Mr B Lilburn, Assistant Director of the Australian Fisheries Service and Chairman of the Southern Shark Fishery Task Force also attended meetings of the Working Group.

Mr G Leyland from the Western Australian Fishing Industry Council attended meetings of the Working Group as an observer.

The Working Group met on six occasions:-

| | |
|-------------|------|
| 5 December | 1985 |
| 17 February | 1986 |
| 5 May | 1986 |
| 19 May | 1986 |
| 21-22 July | 1986 |
| 25 August | 1986 |

During these meetings, the Working Group was able to review all the available research data, including catch history, on the southern shark stocks off Western Australia and to gain an understanding of proceeding discussions within the Southern Shark Fishery Task Force.

The Working Group in reviewing the status of shark stocks off Western Australia identified a need, on both economic and biological grounds, for an immediate requirement to constrain fishing effort, at least to the level applying at April 30, 1985 and to put into place a management framework as a basis for continuing longer term management of the fishery.

This report has been prepared at the request of members of the Working Group, to propose to the Minister for Fisheries management measures for the shark fishery on the south coast of Western Australia.

4. DESCRIPTION OF FISHERY

A detailed statement on the shark fisheries off Western Australia can be found in the Departmental Report "Commercial Shark Fishery in Temperate Waters of Western Australia" (in press). An abstract of that report can be found in Appendix 1.

In essence the shark fishery of southern Western Australia is based in three major species, bronze whaler shark, whiskery shark and gummy shark. The dominance of these three species within the total catch varies significantly as one progresses westwards from the South Australian border to waters off Bunbury. In waters east of Denmark, the component of gummy shark in the total catch is much more significant than west of this area. Bronze whaler shark landings and those of whiskery shark are much more dominant in the catch west of Denmark especially in waters off Augusta and the south west coast.

The shark fishery consists of twenty or so fishing units that depend heavily on shark as a means of earning an income from fishing. These boats principally operate as gill net vessels each using up to 8 kms of gill nets which are stored on modern hydraulic shark reels. A small number of specialised shark boats also use longlines with baited hooks to catch shark.

A much greater number of boats also fish for shark seasonally or as an adjunct to their other fishing operations. These boat owners (between forty and fifty), whilst not being totally dependent on shark catches for their income, consider shark fishing as part of their multi-species fishing strategy and as an integral component of their total fishing operations.

Within this group are a small number of estuarine fishing units which employ a limited amount of gear to take shark

in marine embayments. In addition some salmon fishermen and other beach fishing units use small amounts of net to take shark on an occasional basis. Within this group are also pilchard, tuna and rock lobster vessels which fish for shark seasonally, with the aid of shark reels and gill nets.

Summary details on the composition of shark catches and numbers of operative fishing vessels can be found in the tables at the end of this report.

Examination of these tables indicate the following -

- . Fishing effort has increased significantly in the shark fishery south of 33° S latitude.
- . There has been a 126.5 percent increase in fishing effort in the south-west zone of the fishery, extending from Bunbury to Windy Harbour, during the period 1983/84 to 1984/85.
- . During the same period there has been an increase in fishing effort of 54 percent in the southern zone of the fishery, extending from Windy Harbour to the Western Australian/South Australian border.
- . Total landings of gummy and whiskery shark have not increased in recent years despite substantial additions to fishing effort. Catch rates have therefore declined.
- . A significant proportion of the total shark catch off the south coast of Western Australia is taken by a small number of specialist shark vessels.
- . There is a substantial part time shark fishing component within the southern Western Australian fishing fleet.

5. STATUS OF THE SOUTH COAST SHARK FISHERY

The Working Group upon reviewing the available data on the southern Western Australian shark fishery has prepared the following current assessment of the fishery taking into account information provided by the research branch of the Fisheries Department.

The Working Group noted:

1. With the availability of only limited independent research data, judgements on the biological status of the fishery were made mainly on the basis of commercial catch statistics, sampling of commercial catches, relevant research results and knowledge of the literature.
2. Available data suggest that the fishery exploits adult whiskery and gummy shark through the entire range of their respective distributions.
3. Attributes such as low fecundity (breeding capacity), the relatively long period until the females first produce young, and slow growth rates make shark species particularly susceptible to recruitment overfishing ie. in each year, catching more fish than grow into the exploited population in that same year. In addition, one of the consequences of these characteristics will be a lag time of at least five years between fishing and its effect on subsequent recruitment. This also can have the effect of making assessments based on catch and effort data falsely optimistic.
4. Mesh selection problems make the interpretation of available sampling data difficult. The fishery is based on a number of shark species together with a scalefish component, the catch of which is roughly equivalent in weight to between 20-25% of the total

shark catch. Selectivity for different species will differ at each mesh size.

5. Additional refinement of the Australian Bureau of Statistics (ABS) catch data was required to:

- (a) correct for differences in fishing power of different classes of vessel;
- (b) make allowance for possible changes in the composition of unidentified sharks recorded in the 'other shark' category in the ABS system;
- (c) correct the bias in recorded effort resulting from variations in the number of sets per day and the fishing time per set in the Esperance region.

6. Traditionally biologists have assumed that catch per unit of effort (CPUE) provided a good index of stock abundance. However fishermen tend to concentrate their fishing activity in areas of, and during periods of, relatively high abundance. This is particularly common when they are trying to maintain individual catch rates under conditions of increasing levels of overall fishing effort. In these circumstances CPUE provides an unrealistically high index of stock abundance. That is stocks are really at levels of abundance lower than those indicated by catch rate data.

The Working Group was able to conclude that:

- 1. Analysis of the ABS data indicate that total fishing effort on shark both south and north of 33°S latitude has been increasing rapidly, particularly in the waters of the region extending from Augusta to Lancelin.

2. Based on the analysis of ABS data, the catch rates of each species have declined, as might be expected with increasing fishing effort. This was confirmed by analysis of the limited set of early logbook data which was available.
3. Early logbook data also showed that catch rates varied seasonally throughout the year, although this effect was less apparent in the more recent years when fishing effort was higher. Targeting on individual species was identified as taking place during the fishing season. This varied between localities and individual operators.
4. In the event that the gummy shark stock off Western Australia is identified as the same stock currently exploited in the South Eastern Australian Shark Fishery, then catches are declining for the total fishery at current levels of high effort. The observed decline in catch per unit effort within the Western Australian segment of the fishery has occurred without a reduction in catches. In the South East however, catch is declining and there has been an observed fall in abundance. In these circumstances there is a requirement on biological grounds to reduce current exploitation levels within the total fishery.
5. In the event that the gummy shark stock off Western Australia is identified as a different stock to that currently exploited in the South Eastern Australian Shark Fishery, (as total catches off Western Australia have not declined and noting the above), there continues to exist a requirement to constrain fishing effort.
6. Bronze whaler catches and catches per unit effort are being maintained.

7. The total effort on whiskery shark has almost doubled and in some segments of the fishery, catches have not been maintained. On biological grounds there exists a requirement to constrain fishing effort on this species.
8. Industry advises that they are experiencing declining returns from shark fishing largely as a result of declining catches per unit of effort and a need to expand total effort to maintain income levels. Fishermen representatives were concerned at the potential for greater mobility within the fishing fleet to further add to the costs of fishing and further increase effort.
9. There is a requirement not only for constraining fishing capacity so as not to exceed its present level of fishing effort, but to reduce fishing fleet capacity gradually over time as the efficiency of the fishing fleet improves. These improvements result from changes in gear efficiency, such as those related to net construction, or extension of the current range of mesh sizes (particularly a reduction in mesh size), or other technological innovations.
10. While noting the slight indication of a decline in the catch of whiskery shark, particular concern was expressed about the state of this stock. The shark fishery needs to be carefully monitored especially in view of the long time lags between fishing the adults and the effect on subsequent recruitment.

Taking into account the above conclusions, the Working Group therefore concluded that it would be most prudent to prevent any further escalation in fishing effort on shark beyond the level operating as at April 30, 1985.

In supporting this position it was recognized by the Working Group that further restrictions towards reducing fishing effort targeted on gummy shark may be necessary should future research show that gummy shark taken off south eastern Australia are part of the same stock exploited within Western Australia.

(Three scientific shark stock assessment workshops held in South Eastern Australia in March 1983, August 1984 and April 1986, advised that sufficient biological evidence exists to indicate a deteriorating stock situation. Advice from the April 1986 workshop was such that reductions in exploitation levels on gummy shark were considered warranted).

The Working Group were therefore of the opinion that the growth of fishing effort within the fishery needed to be curtailed and subsequently developed the following set of proposals for the long term future management of the fishery.

6. MANAGEMENT PROPOSALS

6.1 Vessel Access

The Working Group was in agreement that its prime concern was to provide recommendations to contain exploitation on shark stocks and to provide the administrative framework for long term management of the fishery. This was considered particularly important in view of the uncertainties surrounding the status of gummy and whiskery stocks off the south coast.

These objectives could only be achieved by restricting access and placing appropriate limits on the amount of gear used and by placing constraints on the amount of time individual fishermen operated in the fishery.

The Working Group was aware of the Western Australian Fishing Industry Councils advice to the Minister for Fisheries supporting limited entry as the fundamental first step towards management.

The Working Group was also conscious of industry's desire for the fishery to be managed as a limited entry fishery and that open access as a continued management philosophy was no longer supported.

1. Recommendation

That the southern Western Australian shark fishery be declared to be a Limited Entry Fishery.

6.2 Species

Whenever fisheries management includes a limited entry regime, the question of controls on the take of a species or in the use of gear has to be decided.

Within the shark fishery a large number of shark species are taken, including bronze whaler, gummy, whiskery, carpet, pencil, school, hammerhead and grey nurse shark in addition to a significant scale fish catch component of about 20-25% of the total shark landings. Shark are caught by a variety of fishing methods including shark mesh (gill) nets, demersal longlines, droplines, handlines and as an incidental catch in trawling and beach seining.

The major proportion of the total shark landings is taken by the principal fishing methods of shark gill mesh nets and demersal longlines.

The Working Group therefore focused their attention on the taking of all shark and fish by the method of demersal gill mesh nets and demersal longlines.

However, the Working Group were made aware of a small number of fishermen who specifically targeted on scalefish and took small amounts of shark as a by-catch.

The Working Group believed that it was not necessary to limit these fishermen's scalefish activities through the introduction of shark management.

It is therefore acknowledged that special concessions should be made for such fishermen to continue their scalefish activities. Administration of this would be undertaken in the field through Fisheries Field Enforcement Staff.

2. Recommendation

That the Limited Entry Fishery relate to the taking of all shark and scale fish by the methods of demersal gill mesh nets and demersal longlines.

6.3 Boundaries of the Limited Entry Area

The terms of reference have identified the area of the fishery to include all waters, both State and Commonwealth between the South Australian-Western Australian border and south of 33° south latitude on the west coast just north of Bunbury.

This description provides a clear demarcation of boundaries and enables the data collected from fishermen's monthly catch returns to be used as a basis for determining past levels of involvement in the fishery and future access entitlements.

The Working Group was able to identify two areas of concern regarding the proposed boundaries.

Fishermen advised that an important part of the whiskery shark fishery was in deeper water just north of 33° south latitude. It was argued that if the whiskery shark stocks in the south west were to be properly managed, the waters south of Cape Bouvard should be included within the management plan.

In considering this further, the Working Group recognized that by extending the boundary northwards a distance of nineteen or so miles, the catch records could not be used to adequately distinguish those that had fished historically south of Cape Bouvard and northwards. For this reason the Working Group proposed a buffer zone area between 33° south latitude and Cape Bouvard, within which only those having an access entitlement to the south coast shark fishery or a history of fishing south of Cape Bouvard would be entitled to fish.

On a similar basis, the Working Group was made aware of a small group of South Australian shark fishermen who

historically fished within one hundred nautical miles of the South Australian-Western Australian border. It was not considered appropriate to incorporate this group of fishermen within the overall fishery but to provide supplementary access within a buffer area consistent with their historical involvement in the fishery. It was suggested that negotiations also be undertaken with the South Australian Government and shark industry to widen the buffer area on the South Australian side of the border to take account of the historical entry of Western Australian vessels across the proposed boundary.

The Working Group expressed concern over recent developments in the shark fishery north of 33° south latitude and the possibility of an increase in fishing effort following management of the southern shark fishery.

This area was not covered in the Working Group's terms of reference. However it was agreed that catch and effort from this region should be continually monitored by the Fisheries Department. If it was determined by any on-going management advisory committee that increasing pressure was being placed on this area then some form of management could be introduced.

3. Recommendations

- (a) That the area of the fishery be defined to include all waters to the boundary of the Australian Fishing Zone below high water mark encompassing both State and Commonwealth waters between the South Australian-Western Australian Border and 33° south latitude on the west coast of Western Australia.
- (b) That buffer areas be established for waters between 33° south latitude and Cape Bouvard and separately

at the South Australian-Western Australian border to take account of the supplementary access entitlement of fishermen who have fished in these areas, without providing full access entitlement to the southern Western Australian shark fishery. This access entitlement is to be non-transferable and reviewed annually.

- (c) That catch and effort from the shark fishery north of 33° latitude be monitored by the Fisheries Department.

6.4 Mesh Size Limits

Research advice from the Shark Stock Assessment Workshop held in Victoria in April 1986 concluded that the breeding potential of gummy shark would be significantly enhanced by the introduction of a minimum mesh size of 17.5cm (7"). It could also be argued that maintenance of this 17.5cm mesh size as a minimum would reduce the risks of stock collapse, although controls on levels of exploitation was identified as the key measure towards preventing stock failure.

The Working Group in considering this issue recognized that for the most part, shark fishermen operating east of Cliffy Head used 17.5cm (7") mesh gill nets. There was also wide industry support, especially within the Esperance region, for minimum mesh size controls within the eastern segment of the shark fishery where gummy shark catches are more significant.

Westward of Cliffy Head, the Working Group concluded that whiskery shark was a much more significant component of shark landings. Fishermen within this area tended to use a combination of 16.25 cm (6½ inch) and 17.5cm (7 inch) shark mesh nets depending upon their target species.

The Working Group as a conservation measure saw value in implementing minimum mesh size restrictions of 7" mesh in waters east of Cliffy Head and at least 6½" mesh in waters west of Cliffy Head within the area of the fishery.

In supporting these proposed management controls, it was recognized that some fishermen, based east of Cliffy Head, were currently using 6½" mesh gear.

The Working Group proposed that these fishermen be registered by the Fisheries Department and be allowed to use the smaller gear until January 1, 1989 or until such time the gear reaches the end of its economic life, whichever is the sooner.

Further, it was recongised that some fishermen based west of Cliffy Head had historically used 6½" mesh in areas east of Cliffy Head. If such fishermen gain access to the proposed buffer area east to Point Irwin, it was agreed they be permitted to continue to use 6½" mesh (see section 6.12).

The Working Group recognized that there could be conservation value in placing a maximum mesh size of 7" in the shark fishery, to minimize the impact of extensive gauntlet fishing on shark. The view was expressed that as shark increased in size with age, they become less susceptible to fishing. A maximum mesh size potentially could provide some degree of protection to larger female gummy shark.

On further reflection however, industry members argued that in practical terms, few fishermen would use larger gear than 7 inch mesh and that fishermen using 8 inch mesh were generally targeting on bronze whaler shark, which was of less concern.

Representatives from the south coast supported a minimum mesh size of 7" throughout the shark fishery. However it was brought to the Working Groups attention that at this stage there was no strong biological evidence to support the use of 7" mesh in areas west of Clifffy Head to enhance conservation of shark stocks, and in particular whiskery shark stocks.

Therefore, the Working Group supported further examination of the effect of using 6½" mesh in areas west of Clifffy Head and the effect that a universal 7" mesh may have in enhancing the conservation of whiskery shark stocks.

4. Recommendations

- (a) That a minimum mesh size restriction of 17.5cm (7" mesh) be introduced for all shark gill net used in waters east of Clifffy Head.
- (b) That a minimum mesh size restriction of 16.25 cm (6½" mesh) be introduced for all shark gill net used in waters west of Clifffy Head.
- (c) That fishermen historically using smaller mesh gear than that being recommended for use in the above areas, be registered with the Fisheries Department and permitted to use the smaller gear until January 1, 1989 or until such time that the gear reaches the end of its economic life, whichever is the sooner.
- (d) That it be noted that the Working Group support further examination of the effect of using 6½" mesh rather than 7" mesh in areas west of Clifffy Head to determine if this will enhance conservation of whiskery shark stocks.

6.5 Criteria for Entry

The Working Group spent a great deal of time discussing the criteria for entry to the fishery. The press release issued by the Minister for Fisheries on April 30, 1985 outlining the release of the discussion paper on future access arrangements for Western Australian fisheries, was accepted as the bench mark date for the development of entry criteria.

This date was also reaffirmed by the Minister for Fisheries in the statement to industry within the press release announcing the formation of the Shark Working Group on November 7, 1985. This bench mark date was subsequently accepted by the Western Australian Fishing Industry Council.

In considering criteria for future access to the shark fishery, the Working Group were guided by discussions taking place within the Southern Shark Fishery Task Force under the Chairmanship of Mr B Lilburn of the Australian Fisheries Service. The Working Group were also conscious of the need to take account of the large part time shark fishing component within the fishing fleet and therefore needed to adopt criteria which provided access for the specialized shark fishing fleet as well as for the diversified fishing boats which fished for shark at a lower level or seasonally.

The Working Group were of the opinion that any historical claim for future involvement in the shark fishery needed to be supported by a continuing participation in and commitment to the shark fishery during the qualifying period and after the benchmark date.

In supporting this position, the Working Group did not wish to generate additional fishing pressure as shark

fishermen set about proving their continuing commitment once the proposed entry criteria were first generally known. Under these circumstances, the only period of relevance to demonstrate continuing commitment is that between the bench mark date and the date for release of the Chairman's Interim Report on June 16, 1986. This date is to be considered where individual fishermen marginally meet the access criteria, but an assessment of whether they have a continuing commitment is required.

It was also recognized that 1984 and 1985 in particular was a period of considerable uncertainty within the fishing industry on the south coast. For this reason, access criteria were proposed which took separately into account boat transactions that resulted in the ownership transfer of a boat and licence, with their attached fishing history, as distinct from a boat replacement, where the replaced boat leaves the fishing industry and fishing history attaches to the replacement boat.

The three year qualifying period in terms of fishing history is the same length of time as adopted within the access criteria for entry to the South Eastern Australian shark fishery.

In establishing the criteria, noting that many Western Australian fishing vessels did not hold Commonwealth fishing boat licences, and a small number of interstate vessels did not hold a Western Australian fishing boat licence an "either/or" holding of a relevant boat licence was considered sufficient.

The Working Group also recognized the relative leniency inherent in the criteria and therefore felt that the criteria needed to be rigorously applied. Any access granted outside this criteria should be through an appeals system.

5. Recommendations

That the following set of criteria be applied for entry to the southern Western Australian Shark Fishery.

The holders of a Commonwealth boat licence or Western Australian fishing boat licence may apply for endorsement of their licence to allow a boat to be used for gill netting (*) (**) of shark in all Western Australian and Commonwealth waters below high water mark which are west of 129° east longitude and south of 33° south latitude, provided the following conditions are met:-

- (a) The boat to which the licence applies has been used to take shark at some time during the period commencing May 1, 1982 to April 30, 1985;

and

- (b) The average annual shark catch within the area of the fishery during this period since commencing to fish, has been two or more tonnes landed weight, evidenced by catch and effort returns submitted prior to June 30, 1985;

and

(*) For the purposes of definition, shark nets or gill nets are defined as monofilament mesh nets with a minimum mesh of 16.25cm. (6½ inches).

(**) For the purposes of determination of access, the taking of shark by demersal longline may be taken into account by substituting the term longline in the place of gill nets.

(c) the owner of the boat can demonstrate a continuing commitment to and economic dependence on the shark fishery;

and

(d) if on or after April 30, 1982, a boat which satisfies the above conditions was sold as an operative fishing boat with the fishing licences transferred to a new licensee the fishing history would apply to the new licensee as if the current licensee was the original licence holder;

or

(e) if on or after April 30, 1982, a boat which satisfies the above conditions was replaced, the boat which was replaced will be deemed to have left the fishery, and only the replacement boat will be eligible for an authorization.

(f) That no vessel access be granted outside the criteria stated in 5(a)-(e) inclusive unless through an appeals system.

6.6 Allocation of Time and Gear Entitlements

6.6.1 Allocation of Time Entitlements

The major single difficulty in the management of the shark fishery by gear controls arises from the potential for part time shark fishermen to escalate their fishing activity to become operative, full time units in the fishery. This can be achieved by existing units utilising more gear or using the same gear more frequently.

The net effect is continual expansion in fishing effort and thus fishing mortality, without effective constraints being placed on total exploitation within the fishery.

This dual requirement to regulate gear usage and time access is clearly underlined by the observation that 10 vessels within the fleet take upwards of 50% of the total aggregate south coast shark catch. The upgrading of a part time fishing vessel to a full time shark fishing vessel can thus have a marked impact on the total landings within the fishery and has the potential to negate any attempts to constrain fishing effort or reduce fishing capacity gradually over time.

In addressing this particular problem the Working Group initially sought to separate full time and part time shark vessels into two groups once they were granted access to the fishery under the criteria for entry. This separation would have been based on an additional tonnage criteria.

Full time shark vessels would have been allocated 12 months access to the fishery whereas part time shark vessels would have been allocated full time access rights for that part of the year equating to their historical time spent shark fishing.

This proposal was presented to industry through the Chairman's Interim Report which was released for comment on June 16, 1986.

Following extensive discussion with industry the Working Group decided that the categorization of individual fishermen was inequitable and a fairer option would be to allocate all access on the basis of the historical amount of time spent shark fishing.

In order to reach agreement on a practical option for determining and managing time access, the Fisheries Department made it known that it could not administratively provide for time access in periods less than multiples of a single month.

The Working Group therefore focused on the means of allocating the level of time access for all vessels meeting the entry criteria in units of months.

In order for such a system of allocation to be operative, data needed to be available on the amount of time each vessel spent shark fishing in the qualifying period. The monthly catch and effort returns submitted by fishermen provides this data on the number of months each vessel spends shark fishing.

Initially the Working Group proposed that each vessel should be allocated one month's access for every twelve days fished by a particular vessel over a year in the shark fishery. The figure of twelve days was based on the average days fished per month by the top ten catching vessels within the specialist shark catching fleet.

However, the Working Group noted that the number of days each fishermen spent shark fishing was highly dependent on weather conditions and varied from port to port. It was therefore not possible to equate a general number of days which proxied for a month's fishing out of each anchorage. The Working Group therefore accepted that time access would have to be granted on the basis of the number of months fished in any particular year regardless of the number of days fished in each month.

The Working Group therefore propose that any vessel once granted access under the entry criteria, should be unitised in time (month) access units in accordance with

historical levels of participation within the southern shark fishery.

The level of time access should be based on the maximum number of months fished productively for shark in any one year, during the three year period prior to April 30, 1985, regardless of the number of days spent shark fishing in each of these months.

Because the criteria period is three years prior to April 30, 1985 each year is the twelve months from May 1 in one calendar year to April 30 in the next.

Many fishermen from the Bunbury area expressed concern over the above time access proposals and in particular the loss of fishing time in a nominated shark fishing month due to poor weather.

These fishermen were more in favour of a seasonal closure as an effort reduction mechanism within the shark fishery. However, the Working Group considered that to have the desired effect on fishing effort the closure would need to occur in the best shark fishing months and possibly over a long period of time.

The Working Group was also mindful that the effect of a closed season was not spread evenly over all fishermen. Some fishermen, particularly full-time shark fishermen, would be disadvantaged to a considerably greater extent than some others. Therefore, a closed season as a major effort reduction mechanism would have a differential and inequitable effect on fishermen.

6.6.2 Allocation of Gear Entitlements

If fishing capacity is to be controlled within the shark fishery, a method for unitization of gear used also becomes necessary.

For the purpose of this proposed management plan, shark nets are defined as gill nets with a minimum mesh size of 16.25 cm (six and a half inches). They are usually made of monofilament nylon with oval section twisted strand. Nets range in depth between 12 and 25 meshes deep, and there has been a small trend in recent years to deeper nets.

Most net panels are between 250 and 300 fathoms (500-600 metres) in length depending on the amount of slack hung into the net (usually 33.3% but sometimes 50%).

These nets, when not in use are generally stored on specifically designed hydraulic reels which are also used for hauling and setting.

Longlines are used with either attached or detachable snoods spaced between 3 - 5 fathoms apart (6-10 metres). Hooks are usually size 10/0 or 11/0. The mainline is usually 19 - 22 millimetre sisal rope, and in the case of fixed snoods is used in sets of 200-300 hooks.

The longline hooks and ropes are often stored in bins or specially designed boxes when not in use.

The Working Group, in its consideration of gear entitlements, examined several ways in which the quantity of gear allocated to entitlement holders could be determined. The most important of these were the quantity used in the immediate past (prior to April 30, 1985), the size of the boat, and the catch taken during the qualifying period.

The Working Group found no significant relationship between size of vessel and the amount of gear used. This conclusion was not unexpected noting the substantial difference in activity between those fishermen who spent

only a part of their operation fishing for shark compared with fully committed shark fishermen.

Allocation of gear entitlements on the basis of quantity used is probably the most straight forward and acceptable method to use, assuming it can be accurately assessed.

The monthly catch and effort returns provide a reasonable summary record of gear usage by fishermen over many years. In the case of gill nets, the amount of net used is proxied by its length and in the case of longline by the number of hooks.

Basing gear entitlements on the quantity of shark caught presents a number of problems, particularly for part time shark fishermen. For example some seasonal shark fishermen, ie. rock lobster fishermen who also fish for shark for a short time each year using a full set of nets, would qualify on this basis for only a small number of nets. This would cause their continued operations in the shark fishery to be no longer viable.

For these reasons, the Working Group believed the most equitable method for allocating gear units would be that based on levels of usage during the twelve month period immediately prior to April 30, 1985.

In considering this issue further, it was recognized that the full time shark fleet is having the major impact on shark stocks. The requirement to reduce access to the shark fishery for other fishermen has resulted from the increase in the effort and catching efficiency of specialist shark fishermen during recent years.

The introduction of limited entry management will by itself also generate a new set of cost pressures on transfer of licences that will indirectly cause increases in fishing pressure.

For these reasons, the Working Group believed some action should be taken to limit the maximum amount of gear to be allocated to each boat. It therefore supported the proposition that the maximum initial gear allocation for any vessel be fixed at 10 net units or 2000 hooks. This measure will provide for an immediate small downward adjustment of fishing capacity.

In suggesting this proposition, it is recognized that this limit impinges directly on a small number of large specialist shark vessels. It was argued that this group benefited most from the introduction of limited entry management and therefore had the greatest financial capacity to make adjustments, to make up for shortfalls in any initial gear allocation.

The Working Group also believed that no time/gear access should be granted outside the criteria proposed unless through an appeals system. This is in accordance with recommendation 5 (f).

6. Recommendations

- (a) That any vessel once granted access under the entry criteria, to be unitised in time/gear month access units in accordance with historical levels of participation within the southern Western Australian shark fishery.
- (b) That the level of time access be based on the maximum number of months fished productively for shark in any one year, during the three year period prior to April 30, 1985. For this purpose a year will be from May 1 to April 30.
- (c) That gear used within the shark fishery be unitised and that the initial allocation of gear units for

gill nets and longlines be based on the length of nets and/or number of hooks used by each vessel in accordance with the level of usage in the twelve months prior to April 30, 1985 or the last year fished to a maximum of 10 nets or 2000 hooks. (A gear unit will equate to 600 metres of gill mesh net i.e. the amount of hung net equating from a bundle of 1000 yards or in the case of longline 200 hooks).

- (d) That no time/gear access be granted outside the criteria stated in 6 (a)-(c) inclusive unless through an appeals system.

6.7 Transferability of Time/Gear Entitlements

By unitising both gear and time access within the shark fishery, the Working Group argued that authorization holders would be given the maximum flexibility in planning their future fishing arrangements by allowing entitlement holders to accumulate additional access entitlements through entitlement amalgamation.

The Working Group therefore propose that individual time/gear units be totally transferable. Over time, this mechanism provides the means for reducing the number of shark fishing vessels whilst at the same time providing individual fishermen maximum financial flexibility.

For example, an entitlement holder having an access entitlement of say forty eight time/gear access units (eg. six months fishing with eight units of gear) could increase this to say seventy two time/gear month access units through the acquisition of twenty four time/gear month access units.

Initially the Working Group proposed that the authorization holder could then decide whether to fish

six units of gear over twelve months or twelve units of gear over six months or some other combination of time and gear usage.

However, the Working Group acknowledged that authorization holders could then dramatically alter their historical fishing operations and place intense pressure on the fishery at a particular time.

Thus the Working Group propose that the initial combination of gear/time access units be set for each entitlement holder in accordance with his historical usage. There is, however, no restriction on which particular months an entitlement holder chooses to fish.

However, in order to provide some flexibility the Working Group propose that any additional units purchased may be added in any combination of gear and time.

It follows that if an authorization holder is allocated six months fishing with eight units of gear he is locked into this combination. However, if he purchases an additional twenty four time/gear month access units, these may be added as any combination of gear and time.

In providing the flexibility inherent in transferability the Working Group supported the proposition that the minimum holding of gear units through the sale of entitlements be equivalent to three and a half net or longline units (700 hooks) upon gear unit transfer.

This minimum holding was considered desirable to limit the creation of smaller less viable full time shark fishing vessels.

As a further measure of control, in order to limit the establishment of a large mobile shark fishing fleet the

Working Group supported a maximum holding of 14 net units or 10 longline units (2000 hooks) for any single authorization.

The Working Group in providing the maximum flexibility for fishermen in the transfer of access rights, argued that where gear units are sold separately to the general entitlements of a fishing boat licence, that is through gear unit stripping, that the endorsement for that vessel shall subsequently lapse.

To do otherwise was seen by some members as being inequitable.

7. Recommendations

- (a) That time/gear month access units be fully transferable with trading allowed down to half gear units (one half net unit will equate to 300 metres of gill mesh net, and one half hook unit will be 100 hooks).
- (b) That the combination of time/gear access units be set for each authorization holder in accordance with their initial allocation. However, additional units purchased may be added in any combination of gear and time.
- (c) That in the event of gear unit transfer there be a minimum holding of 3½ gear units with a maximum holding of 14 gear units.
- (d) That in the event of gear unit stripping (ie. a licensee transfers all of his gear entitlement) of a licensed shark vessel the endorsement for that vessel shall subsequently lapse.

6.8 Nomination of Time Access Entitlement

The Working Group propose that in the administration of the time/gear access arrangements, entitlement holders should be given the option each year to select which months they will be undertaking shark fishing in accordance with their initial allocation of time access. This arrangement is to be administered by the local Fisheries Officer at each of the major fishing ports following advice from each authorization holder. Nomination of fishing months could occur at any time of the year.

The Working Group also propose that entitlement holders should not be permitted to carry shark gear on board in those months not nominated for shark fishing.

However the Working Group did recognize the difficulty and expense involved in having to take shark gear off the vessel at particular times throughout the year.

In these cases the Working Group believed that alternative arrangements could be made with the local Fisheries Officer in accordance with recommendation 15(c) which delegates administrative authority to local Fisheries Officers.

The Working Group was also made aware of operators not holding entitlements who will be fishing for shark outside the boundaries of the limited entry area but returning to a home anchorage within the limited area with shark gear on board the vessel.

The Working Group believed that these fishermen could not be restricted under recommendation 8(b) and should be able to carry shark gear on board their vessel through the limited entry area.

The administration of this would occur in accordance with recommendation 15(c).

8. Recommendations

- (a) That shark entitlement holders nominate the months they wish to fish for shark in accordance with their time allocation in 6(a). Nomination may occur at any time throughout the year.
- (b) That shark gear shall not be carried on board the vessel for those months not nominated for shark fishing, unless alternative arrangements are made with the local Fisheries Officer.

6.9 Joint Holdings of Hook and Net Gear Entitlements

As a general principle, the Working Group considered shark mesh net to be a more efficient method of catching shark than baited longlines. For this reason, it is proposed, at least for the early years of the shark management programme, not to allow the conversion of hook units to net units and vice versa.

The Working Group did, however, favour further examination of the relative catchability of hooks and nets so that a formula to interchange gear units could be considered at a later date.

The Working Group was also aware that a small number of shark fishing boats would qualify for both a hook gear allocation and a net allocation, depending upon past levels of usage. These fishermen will be allowed to continue to use both types of gear but not at the same time.

9. Recommendation

That time/gear units for hooks and nets be not interchangeable. However, the question of relative catchability of hooks and nets should be kept under review so that a formula to interchange units can be considered at a later date.

6.10 Transferability of Shark Entitlements

The Working Group were of the opinion that shark entitlements should be totally transferable. This provides the opportunity for fishermen to upgrade their fishing operations and provides flexibility to individual fishermen. The mechanism also provides, over time, for reductions in fishing capacity (Section 6.13).

10. Recommendation

That shark entitlements be fully transferable with changes in licence holding (ownership) for the authorized vessel.

6.11 Supplementary Access

Within the area of the south coast shark fishery, there are a significant number of beach fishermen and estuarine fishermen who occasionally use a small amount of shark gear, to target specifically on shark.

The amount of shark gear used is generally a single cut of net although on occasions, some fishermen use upwards of 1200 metres of shark mesh net. On almost every occasion these nets are pulled by hand and set off the beach or within marine embayments.

In addition to this inshore group of fishermen, the Working Group's attention was drawn to the view held by

many tuna and rock lobster fishermen, that they should be granted a general access right to take shark to supplement their other fishing activity, as the need arises.

In order to accommodate this view and activities of inshore fishermen, the Working Group initially proposed that any licenced fishing vessel whilst operating within the area of the fishery should be entitled to use either 500 hooks or two gill net units over the whole year.

However, the Working Group recognized after considerable industry discussion that a number of such supplementary access holders would actually gain the same access as some entitlement holders. This occurred because the supplementary access was available over twelve months with the access not being unitized into monthly periods.

The Working Group therefore believed that supplementary access should also be unitized in time and gear units.

As a result the Working Group propose that any vessel which is granted supplementary access should have an entitlement of up to 6 gear/month units based on their historical shark fishing activity. This access can be allocated as any combination of units.

Any higher level of access was considered as unrealistic by Working Group members in terms of the general objectives of the shark management programme.

The Working Group also acknowledged that a large number of vessels have a historical involvement in the shark fishery. A majority of these no longer operate on the south coast or are involved in other fisheries.

The Working Group therefore considered that the supplementary access entitlement should be granted on

application only, to prevent a large number of vessels obtaining access to a fishery in which they were no longer involved.

Initially the Working Group proposed that the supplementary access entitlement should be non-transferable. However, some industry members argued that this supplementary entitlement often constituted an integral part of an individual's fishing strategy. The Working Group recognized this aspect and agreed that if supplementary access was an important part of an individual's fishing operation then it should be transferable as part of an entire fishing unit.

In providing supplementary access, some Working Group members expressed concern at the potential for escalation in shark fishing effort and the undermining of the overall management programme, having regard to the objective of constraining further expansion in fishing effort. This general access entitlement would need to be continually reviewed to determine its impact on the overall shark resource.

11. Recommendations

- (a) That all vessels not qualifying for a shark endorsement under (5) but with a historical involvement in the south coast shark fishery during the last ten years and still operating on the south coast be granted a supplementary access entitlement of up to 6 gear/month units in accordance with historical usage. This to be allocated as any combination of units.
- (b) That supplementary access be granted on application only.

- (c) That supplementary access be transferable if it constitutes an integral part of the fishing operation and if sold with the entire fishing unit.
- (d) That in the event of gear unit stripping of a licensed shark vessel, there be no supplementary access entitlement.
- (e) That this supplementary entitlement to remain unless it is shown that as a group, these fishermen are placing increasing pressure on shark resources to a point that a reduction of fishing effort becomes necessary.

6.12 Zoning Restrictions

The Working Group was made aware of the large increases in fishing effort which had occurred in the south-west region of the fishery as compared to the southern region of the fishery. (See tables 1 and 2).

The Research Branch of the Fisheries Department advised members that the largest increases in effort had occurred in the Augusta, Busselton and Bunbury areas.

Industry members from the south coast regions of Esperance and Albany were concerned about the possibility of fishermen transferring their operations from the south west coast to the south coast effectively resulting in a transfer of fishing effort.

However, the Working Group did recognize the historical access rights of some south-west vessels who had on occasions fished in the southern region of the fishery.

The Working Group therefore propose that vessels historically operating on either the south coast or

south-west coast should not be permitted to transfer their fishing activities and time/gear units from one zone to the other.

The Working Group propose a boundary at Chatham Island which is a point approximately mid-way between Albany and Augusta.

To take account of the historical access rights of some vessels outside of these zones the Working Group propose a buffer area for waters between Windy Harbour and Point Irwin. Those fishermen who have historically used 6½" mesh east of Clifty Head/Chatham Island and gain access to the buffer area will have their operations adversely affected if required to use 7" mesh in the area from Clifty Head to Point Irwin. It was agreed that such fishermen be permitted to use 6½" mesh in that area.

In considering this zoning, the Working Group recognized that following implementation of the shark management programme and the proposed fishing capacity reduction mechanisms this zoning restriction may not be required. It is therefore recommended that this restriction apply for three years only.

12. Recommendations

- (a) That vessels historically operating on either the south coast or the south-west coast should not be permitted to transfer their fishing activities and time/gear units from one zone to the other, in the initial stages of the management plan.
- (b) That there be a boundary at Chatham Island with boats limited to fishing from relevant anchorages each side of the line.

- (c) That buffer areas be established for waters between Windy Harbour and Point Irwin to take account of the access rights of, and mesh size used by, fishermen who have historically fished in these areas.
- (d) That this restriction to apply for three years only.

6.13 Reduction of Fishing Capacity

The introduction of limited entry to a fishery, when used alone, has been shown to be ineffective in reducing fishing effort. This generally arises because the limited number of boats may choose to work harder and technological improvements will allow gear to be used more efficiently. The creation of a monetary value for access rights also creates a financial pressure causing fishermen to be more innovative and efficient in their daily fishing operations.

The potential for future effort increases is also dependent upon the unused capacity within the fishing fleet, at the time of establishing initial access. As a general principle, the more relaxed the entry criteria and the greater the flexibility in transfer of access entitlements within the overall management plan for the fishery, the greater becomes the need to reduce fishing capacity over time.

In considering these aspects, the Working Group believed, in view of the uncertainty surrounding the biological status of shark stocks and the continued decline in catch rates, possibly to uneconomic levels, that it would be prudent within the overall management plan for the fishery to identify possible mechanisms for reduction in fishing capacity. These could then be used to take corrective action as required.

The Working Group was able to identify three major types of mechanisms for reductions in fishing capacity.

- (i) A reduction of gear entitlements at the time of boat transfer or boat replacement
- (ii) Mandatory reductions in gear entitlements by administrative action.
- (iii) A reduction of boats operating within the fishery by a system of industry funded shark entitlement buy-back.

In considering this subject further, the Working Group initially believed that a substantive case could not be made for reductions to be taken under (i) and (ii) without the provision of more specific biological information supporting such action.

The Working Group accepted however a general need to provide for a gradual reduction in fishing capacity to take account of increasing fleet efficiency and anticipated growth in fishing effort with time.

The Working Group therefore proposed the implementation of an industry funded shark entitlement buy-back scheme.

However, following advice from industry the Working Group acknowledged that the buy-back proposal did not directly address the need to reduce excess fishing capacity within the fishery.

Furthermore, the requirement to reduce fishing capacity in a more direct manner was recognized when biological data was presented by the Research Branch of the Fisheries Department which highlighted the large increases in effort which had occurred, particularly in

the south-west region of the fishery (see tables 1 and 2). The potential for further increases was also recognized, if action was not taken to further limit gear and time spent fishing for shark.

The Working Group also noted that virtually no shark fisheries anywhere in the world, other than perhaps the eastern Australian school shark fishery, have withstood sustained levels of fishing effort above that applied in local subsistence fisheries.

Based on this the Working Group were made aware of some additional mechanisms for reducing excess fishing capacity:

- (i) A percentage reduction in gear at the time of initial allocation.
- (ii) An increase in the proposed buy-back levies to increase the scope of the buy-back scheme.
- (iii) A more substantive reduction of time/gear entitlement at the time of transfer eg. 50 percent.
- (iv) The encouragement of "prime" shark vessels to undertake developmental fishing in the deep water shark fishery or mulie fishery.
- (v) A reduction in gear entitlement of say 10% per year each year until total fishing effort is reduced to a "satisfactory" level.
- (vi) A combination of (i) and (v).

The Working Group recognized that in accordance with the available catch and effort data, options (ii) and (iv) did not directly address the need to reduce fishing capacity.

They did, however, elect to retain the buy-back scheme as an option which could be implemented in the future.

The Working Group concluded that two mechanisms were available which would most effectively address the issue of excess fishing capacity within the fishery.

- (i) A 10 percent reduction in gear units at the time of initial allocation together with a two-for-one (50%) reduction in all time/gear units at the time of vessel or gear/time entitlement transfer.
- (ii) A 10 percent reduction in gear units at the time of initial allocation. A further 10 percent reduction of all time/gear units to occur each year until it is determined by the management advisory committee (section 6.14) that the optimum level of capacity has been achieved.

These two options were explored with industry via the Working Group members and general reaction was against a 10% reduction. On further consideration the Working Group felt that a two-for-one reduction [option (1)] was the more equitable mechanism as reductions were confined to those who had taken a voluntary decision to enter or leave the fishery and were fully aware of the consequences of doing so.

Some Working Group members were concerned about the severity of a two-for-one reduction on transfer and preferred to see a lesser amount eg 25%. However all members agreed that some reduction on transfer was necessary.

In considering this further the Working Group realized that there are a small number of shark fishermen who historically used small lengths of net or small numbers

of hooks. Any reductions of this gear would make the fishing operation unviable. The Working Group therefore propose that the percentage reduction in gear only occur down to a minimum of 3½ net units which equates to 2100 metres of net or 700 hooks.

Similarly, the Working Group recognized that there were some fishermen who had, in the past, used in excess of the maximum net allocation of 6000 metres. It was brought to the Working Group's attention that it would be inequitable for such operators to be subject to a reduction in gear to the maximum allocation of 10 net units (ie. 600 metres), and subsequently a 10% reduction in gear units, at the time of initial allocation. It was therefore agreed that such fishermen should take a reduction down to the maximum of 10 gear units.

The Working Group also acknowledged that the rate of transfer may not be sufficient in the initial stages of the management programme to effectively reduce fishing capacity. In recognizing this it is proposed that if the rate of vessel or time/gear entitlement transfer is not sufficient then the management advisory committee may incorporate further effort reductions.

The Working Group saw little value in pursuing specific policies on size of boats at boat replacement due to the diversified composition of the shark fishing fleet. It acknowledged that the major controls on fishing effort were more effectively addressed by controls on gear and time access of individual boats and the number of operative boats within the shark fishing fleet.

13. Recommendation

- (a) That a 10 percent reduction in gear units occur at the time of initial allocation.

- (b) That the percentage reduction only occur down to a minimum of 3½ net units.
- (c) That a two-for-one reduction of all time/gear units occur at the time of vessel or time/gear entitlement transfer. (ie 50%).
- (d) That if the rate of vessel or time/gear entitlement transfer is not sufficient to reduce fishing capacity, further gear reductions may be introduced.
- (e) That at this time, a specific boat replacement policy or buy back policy not be implemented for this fishery.

6.14 Structure of Management Body

The Working Group propose that continued management advice on the fishery should be formalized under an industry/government advisory committee reporting to the relevant State and Commonwealth Fisheries Ministers operating as a Joint Authority under the Western Australian Fisheries Act.

The prime function of this committee would be that of reviewing management arrangements within the fishery and to provide on-going advice on changes as required for the shark fishery management programme.

14. Recommendation

That following implementation of the management programme for the southern Western Australian shark fishery, an industry/government management advisory committee be established to provide management advice on the fishery.

6.15 Enforcement and Surveillance

The Working Group was conscious of the potential for cost imposts on Government from management to flow to the industry sector. For this reason and the need to simplify requirements for field enforcement, the following enforcement principles were recognized by the Working Group. These are listed as follows:

- (i) Shore based enforcement was preferred as it places fewer demands on already scarce resources;
- (ii) Opportunistic surveillance at sea was considered essential in order to maintain the integrity of the overall management plan and to ensure shore based inspections are not readily circumvented;
- (iii) Disruption to fishing operations to be minimised in the development of enforcement programmes;
- (iv) Gear units in excess of individual boat entitlements should not be stored on board the boat;
- (v) All fishing gear should be marked by dann buoys, at both ends of the line/headline rope, and all buoys should bear the imprint of the vessel registration number;
- (vi) As a first proxy on gear units used, the volume of net held on a shark reel and length of longline and hooks stored in standard containers, to be used as an indicative enforcement tool, as to whether fishermen are complying to gear unit allocations.

In attempting to develop reasonable standard ratios between net volume and net length, the Working Group sought the assistance of the Fisheries Enforcement Branch of the Fisheries Department to provide additional data. The Working Group were made aware that similar work undertaken by fisheries enforcement agencies in Eastern Australia point to drum volume of stored net being an adequate measure of length of nets used.

Data was sought from individual shark fishermen on the type of nets used covering parameters such as float size, lead size, head rope, foot rope and filament size, depth of mesh, spacing of floats and leads, net hanging coefficients and mesh size. This data was used to provide reasonable "standards" for calculating stored net volume on shark reels, as relative to net lengths. The same type of data was collated for longlines.

Upon receiving this information, the Working Group decided that net volume should become the controlling parameter for enforcement and gear unitisation.

On the subject of time access, the Working Group propose that District Fisheries Officers should be provided with the authority to administer time access entitlements on a month by month basis.

This flexibility in local management was considered essential for the ease of administration once access entitlements are established.

15. Recommendation

- (a) That controls on gear usage be achieved through the unitisation of net length and/or net volume for mesh nets and standardised line volume and hook numbers for longlines.

- (b) That drum net volume or longline volume and hook numbers within standard containers be used as an enforcement aid on boats when in port, as a proxy for quantity of gear used by individual fishermen within the shark fishery.
- (c) That the administration of time access as defined in 6(a) in the shark fishery be undertaken in the field, through delegated authority to Fisheries Field Enforcement Staff, at each of the major fishing ports within the fishery.

6.16 Additional Controls on Gear Specification

The Working Group propose minimum specifications for gear used within the shark fishery. This action is taken to maintain consistency in the use of gear within the fishery and ensure that relationships between net volume and net length is maintained.

On the subject of depth of nets, concern was expressed by some members of the Working Group at the potential for fishermen to increase depth of nets. This approach if adopted to circumvent controls on net length is likely to increase efficiency of gill nets in taking both shark and scale fish. However some fishermen had a history of using nets 20 meshes deep and the Working Group felt that this should be recognized.

The Working Group saw merit in not allowing fishermen to increase net depth beyond twenty meshes as there was the general concern that fishermen would switch their fishing emphasis from shark to scale fish. Such a development had the potential to have a detrimental impact on inshore demersal fish stocks.

The Working Group however acknowledged the need for the Fisheries Department to provide for deep water gill

netting of demersal fish as an alternative to dropline, trap and trawl fishing techniques.

The Working Group expressed concern over fishermen who had historically used 15 meshes upgrading to the allowable maximum of 20 meshes. The Working Group propose that in this case the authorization holder should be subject to a 20% reduction in gear units. This would account for the extra effort expended by an authorization holder increasing the depth of nets.

Further, the Working Group believed that as an additional mechanism to reduce fishing capacity mesh depth should be limited to 15 meshes in the event of vessel transfer.

16. Recommendation

- (a) That the depth of nets used within the shark fishery be limited to a maximum of 20 meshes.
- (b) That in the event of an entitlement holder upgrading to more than 15 meshes deep there be a 20% reduction in gear units.
- (c) That in the event of vessel or time/gear entitlement transfer, mesh depth be 15 meshes.

6.17 Penalties

The Working Group acknowledged that following implementation of the shark management plan and the proposed time/gear restrictions some full entitlement holders or supplementary entitlement holders may use more gear than initially allocated.

In considering this and the excess fishing capacity within the fishery the Working Group propose that any entitlement holder using more net than allocated should, in addition to penalties set out under the Fisheries Act for breaching the provisions of a Notice implementing the Management Plan, lose this length of net from the initial gear entitlement.

The Working Group also recognized that some full and supplementary entitlement holders may fish months in excess of that to which they are entitled. The Working Group therefore propose that any entitlement holder doing so should, in addition to the penalties incurred under the Fisheries Act, lose this time from the initial time entitlement.

17. Recommendations

- (a) That any entitlement holder using more net than has been allocated to lose that extra length of net from the initial gear entitlement.
- (b) That any entitlement holder fishing more months than has been allocated to lose those months from the initial time allocation.

6.18 Cost of Management

As a matter of principle, the Western Australian Government seeks an access fee from each Limited Entry Fishery administered under the Fisheries Act 1905, at about three quarters of one percent of the gross value of landings. On the establishment of the southern shark fishery as a limited entry fishery, an access charge will be levelled on a pro rata basis in accordance with each

boat's level of access to the fishery. These funds collected by a Limited Entry Licence charge are paid into the Fisheries Research and Development Fund.

18. Recommendation

That an access fee equivalent to three quarters of one percent of the gross value of the shark fishery be charged as a licence fee on the establishment of the fishery as a Limited Entry Fishery.

6.19 Appeals

A number of different types of appeals will arise from the implementation of these proposals.

These appeals will include those seeking access under the access criteria and reconsideration of gear and time access entitlements issued as well as those seeking access under the supplementary access proposals. Experience in other fisheries has shown such appeals are not easily dealt with and are equally demanding on the appellant and those conducting the appeals.

Noting that, the Working Group supported management of the fishery under the Western Australian Fisheries Act, and the establishment of an appeals committee to provide advice to the Minister for Fisheries.

Past experience has shown a degree of reluctance amongst industry participants to make judgements on their peers.

For this reason the Working Group supported the concept of senior Fisheries Department Officers forming the core membership of an Appeals Committee with an independent member from outside the Department, although not necessarily from the Fishing Industry.

The Working Group would support industry representation on the Appeals Committee provided there was strong support and a willingness among industry participants for such an appointment.

19. Recommendation

That an appeals committee be established to consider all appeals and provide advice to the Minister for Fisheries, on such appeals. The composition of the Appeals Committee to consist of at least two senior Fisheries Department officers and an independent person external to the Department.

6.20 Ministerial Discretion

Whenever entry to a fishery is limited and applicants are selected on established criteria, there are bound to be some vessels which do not fulfil the requirements of the criteria but which within the intent of the general approach to the development of the criteria should be considered as a special case by the Minister.

Notwithstanding this, the Working Group recognized the relative leniency in the access criteria and recommend that the Minister pay due consideration to the criteria in the event of appeals.

The Working Group were also made aware of a relatively large number of shark fishermen who were involved in experimental or developmental fishing during the criteria period. Many of these were previously full-time shark fishermen or heavily dependent on the shark fishery and diversified their fishing operations to remain viable in the industry. These recent activities have jeopardised their access to the fishery under the recommended entry criteria or curtailed their time/gear entitlement.

The Working Group therefore propose that these fishermen are duly considered in the event of appeals.

20. Recommendation

- (a) That it be noted that the Minister has the authority to consider applications of a special nature on a case-by-case basis.
- (b) That it be noted that the Minister may impose special conditions on some of the vessels holding authorizations.
- (c) The Working Group request that the Minister pay due consideration to the access criteria in the event of appeal.
- (d) That in the event of appeals the Working Group request that the Minister pay due consideration to those appellants having been involved in experimental or developmental fishing during the criteria period.

6.21 Legislative Action

The Working Group was of the strong opinion that all legislation for management of the Shark Fishery should be under a single Act. For this reason, noting that enforcement of management rules for the fishery will be conducted by officers from the Western Australian Fisheries Department, the Working Group saw value in providing for the management of State and Commonwealth waters under State legislation as a Joint Authority managed fishery under the Offshore Constitutional Settlement arrangements between the Western Australian and Commonwealth Governments.

21. Recommendation

That the southern Western Australian shark fishery be managed under the limited entry provisions of the Western Australian Fisheries Act through a Joint Management authority under the Commonwealth - State Offshore Constitutional Settlement arrangements for fisheries administration.

6.22 Recreational Fishermen

Recent management decisions throughout Australia to introduce limited entry fisheries and, in some cases, individual transferable quotas must be taken into account when considering the sharing of fish resources in the longer term by recreational and professional fishermen.

The Working Group was aware that reductions in fishing capacity for those fisheries operating under a limited entry management plan should be shared by both the professional and recreational fishermen.

In considering this, the Working Group propose that some constraints should be placed on the amount of gear that recreational fishermen can use to take shark in the southern Western Australian shark fishery.

22. Recommendation

That it be recommended to the Recreational Fishing Council that there be a limit on the number of hooks to be used on a set line, and a maximum mesh size of 10 cm (4") to complement the existing minimum of 5.7 cm (2½").

7. ACKNOWLEDGEMENTS

The Chairman acknowledges the work undertaken by each Working Group member and the Department's research and administrative staff in developing the proposed management programme for consideration by the Hon Minister.

Sincere thanks is extended to Mr P Rogers for his work as Chairman for the first five meetings of the Working Group and for his extensive discussions with industry.

Special thanks is also extended to Ms H Brayford for the work undertaken on behalf of the Working Group and in the final collation, editing and compilation of this report, and to Mrs C Porter for her work in its production.

ABSTRACT FROM THE PUBLICATION "COMMERCIAL SHARK FISHERY IN TEMPERATE WATERS OF WESTERN AUSTRALIA"

The Western Australian-based mixed gear fishery for edible shark generally operates from Geraldton to Esperance in waters shallower than 40 fm to a maximum depth of 100 fm. In 1983/84, the total catch was 1262 tonnes live weight. The total shark catch was taken by 158 gillnet boats, 45 longline boats and 152 handline boats. However, nearly two thirds (62%) of these boats caught 1 tonne or less in 1983/84 and were assumed to rely more heavily on other target fisheries than shark.

Of the twenty or so species of shark caught in Western Australia, three species together comprise two thirds of the total catch by weight. These are whiskery shark (Furgaleus ventralis, 23%), Bronze whaler spp. (dominated by Carcharhinus obscurus, 29%) and gummy shark (Mustelus sp., ca. 11%). In some regions other species are more important than gummy shark.

If fishing effort is not taken into account, the trend towards increased annual catch tends to create a false impression of optimism for this fishery. In fact, total fishing effort has grown sharply in the Western Australian fishery from 4048 gillnet km days in 1975/76 to 17170 gillnet km days in 1983/84, a 420% increase since reliable effort figures first became available from the Australian Bureau of Statistics. Gillnets, which took 90% by weight of the total catch, also contributed most to the total fishing effort in 1983/84. During the period compared, the number of gillnet boats increased from 79 in 1975/76 using a mean length of 686 m of net to 158 boats in 1983/84 using a mean length of 1698 m of net. Longliners set up to 12 000 m of gear. As intra-regional competition for the limited shark resource has

increased, so too has effort, and falling catch rates, wherever they occur, have forced some fishermen mainly dependent on shark to leave the industry; to purchase and set more and more gear each year in an attempt to remain economically viable or to place even greater pressure on other fisheries.

It is important to note that this report is based on a retrospective analysis of historic ABS catch and CPUE data and as such does contain certain biases. New research logbook data which should enable correction of the biases has been collected since October 1985. These data in conjunction with a more intensive analysis of the historic ABS data, will help refine estimates of catch and effort and should produce more accurate measures of abundance for the major species in the fishery.

The Western Australian stock of whiskery shark is thought to be fully exploited with clear regional trends of declining catch per unit effort (CPUE) evident. For example, the CPUE for this species has fallen well below the level of economic viability on most grounds in the Metropolitan region. CPUE from the fished population of mostly neo-natal and young juvenile bronze whaler shark has shown no general trend in Western Australia, except to reflect a likely increase in recruit abundance in 1979/80. In the last three years, the CPUE of gummy shark, which like whiskery shark is fished mainly as an adult, is probably also a source for concern. In the Esperance region, the calculated effort on gummy shark may have been underestimated by a significant factor in the last two years. When considered together with an underestimating of gummy shark catch, the effect may significantly alter the low CPUE recorded for 1983/84.

Fishing intention (targeting) by individual boats was examined using catch and boat days as a measure of fishing effort. This allowed some degree of comparison between boats within each method category. It was shown that many shark fishermen on both coasts depend strongly on their income from other

fisheries apart from shark, such as rock lobster or the Shark Bay snapper fishery on the west coast or tuna fishing on the south coast.

Overseas experience of shark fisheries has shown that they are prone to collapse when a single species is heavily exploited. It is felt that, even in a multi-species fishery such as that in Western Australia, there may be serious problems with individual species such as whiskery shark, because the general attributes of shark populations may apply to Western Australia species viz:

- (1) Low fecundity (up to thirty young/breeding females in some species but less in many other species such as whiskery, bronze whaler or gummy).
- (2) A long parturition period (some species breed biennially).
- (3) Slow growth rates.
- (4) Exploitation across a major part of the range of the species distribution particularly for whiskery and gummy shark.

APPENDIX 2

The following set of tables have been prepared as supplementary information to the report.

- TABLE 1 : Total effort (gillnet km days) and Gillnet effort (gillnet km days) X Year X Region for the Southern Western Australian Shark Gillnet Fishery
- TABLE 2 : Annual percentage change in gillnet effort from 1980/81 to 1984/85 by Region
- TABLE 3 : Total percentage change in gill net effort from 1980/81 to 1984/85 X Region compared to average percentage increase in gillnet catch.
- TABLE 4 : Summary of shark catch and effort data for the region south of 33°S
- TABLE 5 : Summary of shark catch data X species for the region south of 33°S
- TABLE 6 : Port of registration X estimated number of vessels meeting access criteria X catch (May 1, 1984 to April 30, 1985) compared to catch of those vessels not meeting access criteria

TABLE 1 : Total Effort* [gill net km days] and Gillnet Effort [gill net km days] x Year x Region for the Southern Western Australian Shark Gillnet Fishery**

| Financial Year Region** | 1980/81 | | 1981/82 | | 1982/83 | | 1983/84 | | 1984/85 | |
|----------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| | Total* | Gillnet | Total | Gillnet | Total | Gillnet | Total | Gillnet | Total | Gillnet |
| Esperance | 2 383 | 1 849 | 3 015 | 2 316 | 3 570 | 3 279 | 4 306 | 4 091 | 7 835 | 7 377 |
| Albany | 1 540 | 1 001 | 1 974 | 1 198 | 2 400 | 1 849 | 2 884 | 1 754 | 2 365 | 1 588 |
| Busselton | 2 774 | 2 616 | 2 665 | 2 580 | 4 275 | 4 043 | 4 721 | 4 646 | 10 690 | 10 521 |
| Metropolitan | 2 089 | 1 578 | 2 092 | 1 691 | 2 495 | 2 188 | 4 759 | 4 290 | 7 622 | 6 438 |

NB * "Total" effort applies only to effort produced by gillnets, longlines and handlines in these defined shark fishing regions. It is applied equally to all species caught [ie. no allowance for targetting] ie. to gummy, bronze whaler, whiskery, wobbegong, other shark, but skates, rays and others have not been included due to the small catch and large unreported component used for bait.

** Regions are defined as specific combinations of Australian Bureau of Statistics fishing blocks, including estuaries.

- ie. Esperance - Bremer Bay to WA border [south]
- Albany - Windy Harbour to Beaufort Inlet
- Busselton - Bunbury to Windy Harbour
- Metropolitan - Jurien Bay to Mandurah

Source: Computer printout compiled by N G Hall and K Bowden of the Western Australian Marine Research Laboratories - run out 30.1.86

TABLE 2 : Annual percentage change in gill net effort from 1980/81 to 1984/85 x Region*

| Financial Year Region | % change in gill net effort from 1980/81-1981/82 | % change in gill net effort from 1981/82-1982/83 | % change in gill net effort from 1982/83-1983/84 | % change in gill net effort from 1983/84-1984/85 |
|--------------------------|--|--|--|--|
| Esperance | 25.3 | 41.6 | 24.8 | 80.3 |
| Albany | 19.7 | 54.3 | -5.1 | -9.5 |
| Busselton | -1.4 | 56.7 | 14.9 | 126.5 |
| Metropolitan | 7.1 | 29.4 | 96.1 | 50.1 |

NB * Regions are as defined in Table 1.

TABLE 3 : Total percentage change in gill net effort from 1980/81 to 1984/85 X Region compared to average percentage increase in gill net catch:

| Region | % change in gill net effort |
|------------------------------------|-----------------------------|
| Esperance | 399.0 |
| Albany | 158.6 |
| Busselton | 379.3 |
| Metropolitan | 308.2 |
| Average for the Fishery | 356.4 |
| Average increase in gill net catch | 173.8 |

TABLE 4 : Shark catch and effort data for the region south of 33°S.

| Financial Year | Catch (Tonnes) | | Effort (Gill net km days) | | Number of Boats | |
|----------------|-------------------|----------------|---------------------------|---------------|-----------------|---------------|
| | Total All Methods | Total Gill net | Total All Methods | Gill net only | Total | Gill net only |
| 1979/80 | 810 | 584 | 5 800 | 4 132 | 153 | 83 |
| 1980/81 | 755 | 614 | 6 697 | 5 467 | 148 | 73 |
| 1981/82 | 1 038 | 872 | 7 654 | 6 094 | 157 | 72 |
| 1982/83 | 882 | 790 | 10 245 | 9 171 | 144 | 85 |
| 1983/84 | 885 | 793 | 11 911 | 10 491 | 152 | 87 |
| 1984/85 | 1 102 | 1 015 | 20 890 | 19 486 | 148 | 87 |

All methods = gill net, longline, handline

Total effort, all methods = equivalent gill net effort

- NB 1. The method of calculating the "equivalent gill net effort" for the catch from other methods has been changed slightly since the report of June 1986.
2. The region south of 33°S is equal to the Busselton, Albany and Esperance regions as defined in Table 1.

TABLE 5 : Shark catch data X species for the region south of 33°S.

| Financial Year | Catch [Tonnes][Live Weight] | | | | | | | | | |
|----------------|-----------------------------|----------------|-------------------|----------------|----------------------|-------------------|----------------------|-------------------|---------------------------|------------------------|
| | Total All methods | Total Gill net | Gummy All methods | Gummy Gill net | Whiskery All methods | Whiskery Gill net | Whiskery All methods | Whiskery Gill net | Bronze Whaler All methods | Bronze Whaler Gill net |
| 1979/80 | 810 | 584 | 112 | 75 | 269 | 204 | 188 | 161 | | |
| 1980/81 | 755 | 614 | 144 | 102 | 230 | 201 | 130 | 121 | | |
| 1981/82 | 1 038 | 872 | 192 | 128 | 429 | 410 | 198 | 183 | | |
| 1982/83 | 882 | 790 | 142 | 119 | 332 | 318 | 205 | 197 | | |
| 1983/84 | 885 | 793 | 127 | 101 | 212 | 202 | 240 | 230 | | |
| 1984/85 | 1 102 | 1 015 | 175 | 155 | 220 | 209 | 327 | 316 | | |

All methods = gill net, longline, handline

TABLE 6 : Port of registration X estimated number of vessels meeting access criteria X catch (May 1 1984 - April 30 1985) compared to catch of those vessels not meeting access criteria.

| Home Port | Number of vessels | Catch (kg) (landed weight) | % of total catch |
|---------------------------------------|-------------------|-------------------------------|------------------|
| Albany | 19 | 93 187 | 14.3 |
| Bunbury | 21 | 292 291 | 44.8 |
| Esperance | 15 | 143 629 | 22.0 |
| Fremantle | 6 | 81 703 | 12.5 |
| Mandurah | 2 | 8 052 | 1.2 |
| SUB TOTAL | 63 | 618 862 | 94.8 |
| Catch by vessels not meeting criteria | | 33 834 | 5.2 |
| TOTAL | | 652 696 | 100.0 |

- NB
- 1) A year is from May 1 to April 30.
 - 2) Catch in tonnes is recorded as landed weight.

