DEPARTMENT OF
FISHERIES AND WILDLIFE
WESTERN AUSTRALIA

REPORT Nº 52

Published by the Director of Fisheries and Wildlife, Perth,
under the authority of the Hon. Minister for Fisheries and Wildlife

The Present State of the Western Australian Fishery for Australian Salmon

BY

MICHAEL H. WALKER

1982

PERTH
WESTERN AUSTRALIA

Department of Fisheries and Wildlife

108 Adelaide Terrace

PERTH

R E P O R T
No. 52

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ISBN 0 7244 9079 5

ISSN 0726-0733

18519—1

CONTENTS

	Page
INTRODUCTION	5
DESCRIPTION OF THE PROFESSIONAL FISHERY, 1975-1981	6
DISPOSAL OF THE PROFESSIONAL CATCH, 1975-1981	7
DESCRIPTION OF THE AMATEUR FISHERY, 1975-1981	7
CHANGES IN FISHING EFFORT BY PROFESSIONAL AND AMATEUR SALMON FISHERMEN, 1975-1981	8
THE PROFESSIONAL SALMON CATCH, 1966/67-1980/81	10
THE AMATEUR SALMON CATCH, 1966/67-1980/81	11
CATCH AND EFFORT IN THE SOUTH COAST PROFESSIONAL FISHERY AS INDICATED BY RESEARCH LOG BOOKS	11
SUMMARY AND CONCLUSIONS ON THE STATE OF THE W.A. SALMON FISHERY	13
ACKNOWLEDGEMENTS	14

TABLES

1.	The number of concession holders and beaches to operate within the south and south-western salmon fisheries in the period 1975-1981.	15
2.	W.A. salmon catch for period 1966/67-1980/81 (kg live wt.).	15
3.	South coast salmon catch by month 1967-1981 (kg live wt.)	16
4.	South coast salmon catch by area 1967-1981 (kg live wt.).	17
5.	Summary of log book data and calculated parameters south coast salmon fishery 1962-1981.	18

FIGURES

		Page
1.	W.A. salmon beaches and the areas to which they belong.	20
2.	W.A. salmon catch for period 1966/67-1980/81 (tonnes live wt.).	21
3.	South coast salmon catch for period 1966/67-1980/81 (tonnes live wt.).	22
4.	West coast salmon catch for period 1966/67-1980/81 (tonnes live wt.).	23
5.	South coast salmon catch by area for period 1967-81 (tonnes live wt.).	24
6.	Number of days beach observed per log book examined, south coast salmon fishery, Pt. Charles to Windy Harbour.	25
7.	Percentage schools caught, south coast salmon fishery Pt. Charles to Windy Harbour.	25
8.	Number of schools sighted per day of beach observation south coast salmon fishery, Pt. Charles to Windy Harbour.	26
9.	Number of schools sighted per hour of beach observation south coast salmon fishery, Pt. Charles to Windy Harbour.	26
10.	Number of schools caught per day of beach observation south coast salmon fishery, Pt. Charles to Windy Harbour.	27
11.	Catch per day of beach observation, south coast salmon fishery, Pt. Charles to Windy Harbour.	27
12.	Average school size caught, south coast salmon fishery, Pt. Charles to Windy Harbour.	28

PLATES

1. Salmon school travelling along a beach. 29

2. Net boat stationed on a beach and ready to be used to net salmon. 29

3. Netting a salmon school, Boat Harbour East, 1979. 29

4. Final stages of hauling, Cheynes Beach 1980. 30

5. Salmon being hauled onto the beach. 30

6 Removal of netted salmon from a net by hand. 30

7. Conveyors may sometimes be used to remove fish from the net. 31

8. Heading and gutting salmon, Bremer Bay, 1977. 31

9. Loading salmon onto a truck for transport to the factory. 31

APPENDIX

1. Salmon research log sheet, as used by salmon fishermen, 1975-1981. 32

Dept. Fish. Wildl. West. Aust. Rept. No. 52, 1982, 1-

THE PRESENT STATE OF THE WESTERN AUSTRALIAN FISHERY FOR AUSTRALIAN SALMON

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INTRODUCTION

In 1975, following a number of years of research by the CSIRO Division of Fisheries and Oceanography, it was decided to conduct a renewed programme cooperatively between CSIRO and W.A. Department of Fisheries and Wildlife. The results of the joint programmes will be presented elsewhere. Meanwhile this paper describes the Western Australian salmon fishery in 1981 and over the life of the current CSIRO/W.A. salmon research programme i.e. 1975-1981. It considers both the professional and amateur fishery, the disposal of the catch and attempts to discuss any changes in technique, effort, etc. which may have occurred in the period 1975-1981.

The professional salmon catch is examined in detail. As the purpose of the current programme was to investigate reasons for the decline in the fishery, from the record years of 1966 to 1968, the period 1966/67 to 1980/81 is considered. It was not the purpose of this investigation to consider the fishery before 1966/67. In the past there has been argument as to the total catch reached for the record years 1966/67 and 1967/68. It was possible during this investigation to check all south coast receival data from 1948 to 1981 and to verify total catch figures for these years. These data will be published separately in the future together with some other of the material considered in this document. Unfortunately it was not possible to check factory receival data from the west coast before 1975, because original receival data is no longer held by west coast processors. Catch data are obtained in both financial and calender years depending upon its source e.g. factory records Albany in calender years and Australian Bureau of Statistics figures in financial years. As most of the catches in recent years occur during the season from February to April in most cases it is reasonable to assume that, for example, the 1967/68 season is equivalent to 1968.

The paper also considers log book data collected by CSIRO and the W.A. Department of Fisheries and Wildlife. In the past these data were regarded as of limited value and giving no indication of fishing effort. It was possible during the course of this programme to collect together log books from CSIRO, W.A. and fishermen and to obtain some meaningful results from them.

Finally an attempt is made to briefly summarise the current state of the W.A. salmon fishery.

DESCRIPTION OF THE PROFESSIONAL FISHERY, 1975-1981

The Western Australian salmon fishery operates as a limited entry fishery throughout southern W.A. from Doubtful Island near Bremer Bay to Busselton. The area of the fishery for administrative purposes is divided into two zones: a southern zone from Doubtful Island to Windy Harbour; and a south western zone from Cape Beaufort to Busselton. The location of beaches fished within these zones is shown (Figure 1). These beaches have been declared proclaimed fishing zones from 15th February until 30th April each year to allow the orderly taking of salmon by fishermen holding salmon concessions. Salmon concessions (licenses) are issued to selected fishermen who control a team operating within the fishery. In the southern zone, concession holders are restricted to a specific beach. In the south western zone, concession holders are permitted to operate on any proclaimed fishing beach within the zone, although in practice only one or two beaches may be fished. The number of concessions which have operated within both zones in recent years are shown (Table 1), as is the number of beaches to be fished within the same time interval.

The fishing method utilized is beach seining. Thus the fishery is shore based. Purse seining for Australian salmon at sea is not permitted in W.A. waters. Fishermen keep a constant visual observation for salmon schools from sand dunes during daylight hours. Aircraft are also used by salmon processors and fishermen to spot fish and to determine the likelihood of future catches. Beach seines, about 400 metres long and 2-3 metres deep are set from rowing boats or jet powered boats, which are shore based. Beach seines in the southern zone usually have a deep bunt in the centre and in the south western zone a bag or pocket. The reason for this is that south western beaches are generally more exposed then southern beaches. Captured schools are hauled onto the beach by hand or with the aid of vehicles e.g. 4 wheel drive Toyota/Landrovers, tractors or trucks. Catches are either transported up the beach in small quantities and loaded into trucks or loaded into trucks directly, depending upon beach conditions. Sometimes motor driven conveyors are used on the beach to load fish directly from the bunt or pocket into the truck.

The fishery operates predominantly during February and March in the southern area and during March and April in the south western area. Sporadic catches are made at other times of the year when fish are accessible. Such catches, however, are of little consequence compared to catches made during February to April. Exploitation rates during the season are high, especially in the area east of Albany and in Geographe Bay.

Concession holders are either full time or part time fishermen. The former are either estuarine or deep sea fishermen who operate on salmon during February to April; the latter are farmers, transport operators and others who fish only for salmon. All concession holders have had a history of involvement in the salmon fishery. Most salmon fishermen also fish for Australian herring Arripis georgianus Valenciennes, 1830 as part of their salmon fishing operations. The Australian herring season follows the salmon season.

The Australian salmon is commonly observed schooling in waters close to shore, throughout its life cycle. The W.A. fishery is based entirely on mature fish in near or spawning condition which migrate through southern W.A. waters to spawn, largely between Cape Leeuwin and Busselton. Thus in terms of movement there is first, a westerly movement from the eastern area of the fishery to Cape Leeuwin, then a northerly movement usually as far as Geographe Bay, although in some years quantities of fish may be caught between Bunbury and Mandurah, at Rottnest Island and in Safety Bay. Today this movement known as the "front run" generally does not progress as far up the coast towards Perth/ north of Perth as in the past, especially the 1960's. After spawning, spent fish may move back towards Esperance. In recent times this movement, known as the "backrun", results only in small catches being made e.g. 1981 backrun catch 38 tonne cf. front run catch 1142 tonne. In the past backrun catches were substantial.

The westerly movement of fish throughout the southern zone is accompanied by a progressive decrease in mean length of fish captured. This can be seen in the sampled catch and is caused by the progressive entry of fish with the same age structure but slower growth rates migrating into the south coast fishery.

DISPOSAL OF THE PROFESSIONAL CATCH, 1975-1981

All the catch goes for domestic consumption within Australia predominantly as a canned product i.e. cutlets or a potato salmon mix (frelish). Some salmon are sold locally as fresh fish, though it is estimated that this accounts for less than one percent of the catch. The heads are fully utilized as rock lobster bait, of which they are one of the most successful. Salmon bodies in the past were sometimes used as bait. However, legislation was passed in 1977 declaring salmon a food fish which prevented further use of the bodies as bait.

During 1981 two processors were involved in salmon processing: Hunts Canning Company in Albany and West Ocean Canning Company in Perth. Prior to the 1978 season the south coast catch was processed by Hunts and the west coast catch by West Ocean. In 1978 West Ocean set up a receival depot in Albany. Direct competition on the south coast for salmon by the processors has led to an improvement in price to fishermen, but also to the removal of incentive for fishermen to clean their fish on the beaches and this practice, which used to be common, has largely ceased. Whole (round) fish are cleaned at Hunts in Albany by a contract cleaning team. West Ocean transport salmon whole, either frozen or in brine, to their Perth factory, from Albany or Busselton. West Ocean, up until 1980, cleaned west coast salmon at its Busselton factory/receival depot.

DESCRIPTION OF THE AMATEUR FISHERY, 1975-1981

The amateur fishery operates using predominantly two methods: angling with rod and reel from the shore, largely using pilchards (mulies) as bait; and trolling through salmon schools from power boats. Some salmon are caught by amateurs occasionally

in set mesh nets. Amateur effort is intensified during the spawning migration i.e. February to April. Some angling occurs at other times often with success. The Australian salmon is one of the finest sport fish available to anglers in Australia.

Amateur fishermen are often both adept at sighting salmon schools and familiar with the behaviour of salmon in certain areas where they may have considerable local knowledge. Amateur fishermen are composed of: (1) people from the metropolitan area either visiting as holidaymakers with or without the intention of fishing for salmon or coming to the area with the explicit purpose of catching salmon e.g. for a weekend or a few days: (2) people from larger centres in the south west or elsewhere with the same purpose as in (1) e.g. from Collie, Manjimup, Bunbury, Albany, Kalgoorlie, etc; (3) local people from the south west coast itself. Most of the amateur success is achieved by local people and people visiting from nearby centres rather than from the metropolitan area.

The amateur fishery is not constrained to specific netting sites i.e. beaches like the professional fishery and may operate, and largely does, in areas away from the professional fishery e.g. Yallingup, mouth of the Warren River, Bornholm, Norman's Beach, Reef Beach, etc.. Improved roads and tracks throughout south-west Western Australia and access to 4 wheel drive vehicles, of which there would appear to be a very high ownership, in the area has led to there remaining few localities between Esperance and Busselton where amateurs do not fish at sometime of the year.

Metropolitan anglers have relatively little success in catching salmon when they visit the south-west area for this purpose or holidaying. They, as a group, were used to catching salmon in the metropolitan area and at Rottnest, up until the late 1960's, where today they have only occasional success in these areas.

Amateurs since 1978 have been limited to a bag limit of 5 fish per day. Most amateur fishing clubs, prior to introduction of this legislation, had bag limits of their own of this order. Unfortunately many amateurs especially those using power boats to troll for salmon ignore this bag limit. This group sometimes may sell their catch. Anglers sometimes have considerable success in some inaccessible areas and achieve sporting satisfaction from catching many fish at one time. Unfortunately they may not release fish they have caught in excess of the bag limit and/or their needs and leave them on the beach, where they may give rise to public criticism. However, amateurs are nowadays much more likely, because of the general rise in the cost of food items, to utilize their catch of salmon as food, where previously it used to be regarded as an inferior quality eating fish.

CHANGES IN FISHING EFFORT BY PROFESSIONAL AND AMATEUR SALMON FISHERMEN, 1975-1981

The mode of operation of the professional fishery has changed little since the inception of the fishery in 1944. Generally throughout the fishery rowing boats are still used with which

to shoot (set) the net when conditions are good. However, today when conditions are poor jet boats may be used for this task. Rowing boats today are constructed of aluminium rather than timber and are lighter. However, they are harder to row and make more noise then timber boats and thus may frighten fish more and sooner than timber boats resulting in a greater loss rate. Nets are today constructed of nylon (mesh and rope) and have plastic floats which can be run over with vehicles, without breaking like cork floats used in the past. The rope used on the net and in hauling is overall stronger than the sisal/hemp ropes used in the past enabling the hauling process to be done with the use of vehicles. Modern nets do not require the lengthy drying process before re-using, as required for the original cotton nets. When all these factors are considered together it may be possible to conclude that overall the fishing operation today is slightly more efficient than in the past.

There has been a reduction in the number of concessions overall in the period 1975-1981 (Table 1). In real terms this reduction has amounted to a loss of 3 operative concessions only, all from the south coast fishery. 5 concessions, which were not used or were only used to a minor degree, have been relinquished or taken away from the south-west fishery and one concession added which has since been well utilized. The overall result from the south-west fishery has been little or no change in effort. In both areas several concessions have been transferred from father to son/sons and in some cases families have begun to exert more influence on the utilization of a concession. The result in those cases has been that effort has increased or become more effective overall. The reason for this situation is that most historical concession holders have been active in the salmon fishery for many years, several since its inception and are now men in their mid 50's and onwards. As such, they are today less able to conduct the operations of a salmon team and require assistance from others, especially sons and family. This was generally not the case, 5-10 years ago. This replacement of concessions/assistance with operations by younger men e.g. sons has therefore resulted in either more effort and/or more effective effort.

The number of beaches overall has been reduced by 2 only, in the period 1975-1981 (Table 1). In real terms this has amounted to a loss of two beaches from the south coast (Pt Charles and Boat Harbour West) and both the addition and the loss of a beach from the south-west coast. Injidup, a beach from where considerable effort can be exerted has been added and Kilcarnup, a beach where very little effort can be exerted, relinquished.

When the number of concessions, beaches fished and changes in fishing technique are considered together in terms of professional fishing effort, clearly little or no change has occurred.

Amateur effort in the period, however, has increased for there has been improvement in the roads and tracks throughout south-west W.A.; there has been an increase in the general availability and ownership of off road vehicles in and visiting the area; and more time has become available for recreational activities such as amateur angling.

THE PROFESSIONAL SALMON CATCH, 1966/67 - 1980/81

The W.A. salmon catch since the record years of 1966/67 and 1967/68, when catches of about 3660 tonnes and 4223 tonnes were attained, declined dramatically over a five year period i.e. 1968/69 - 1972/73 (Table 2, Figure 2). For the last 9 seasons the fishery has operated at a low level of between 754 and 1518 tonnes (average for this time, 1209 tonnes). The lowest catch 754 tonnes was in the 1977/78 season.

The west coast catch declined relatively slightly more than the south coast catch in this period (Table 2, Figures 3 and 4) and the low level of catch from this fishery forced the processor, who utilized the west coast catch, to compete for additional product on the south coast.

There has been a decline in the importance of out of season salmon catches throughout the fishery (i.e. the backrun) in the period since 1967. Examination of catches by month for the south coast, for the period 1967-1981 provides a good illustration of this (Table 3). For the past 6 seasons, catches out of season i.e. not made in the months February-April have been overall of little importance. January catches have also been minimal or non existent in this period except for the seasons 1975 and 1976 when catches were made at Dillon Bay. The fishery overall operated over a longer period in the 1960's than the 1970's. The reason for this would appear to be availability of fish rather than a change in operation of fishermen.

On the south coast, over the time period considered, there would appear to have been some changes in the distribution of the catch between the areas of the fishery (Table 4, Figure 5). Area II i.e. Cheynes Beach to Albany east (Figure 1) in the late 1960's on the average used to take over 50% of the south coast catch, with area I i.e. Pt Charles to Cape Riche (Figure 1) taking around 30% and area III i.e. Albany west to Windy Harbour (Figure 1) taking around 15%. Since this time, generally area I would appear to have overtaken area II in order of importance, with area III remaining at about the same level as in the past (Table 4, Figure 5) i.e.: area I had consistently above average catches, with lows in 1974 and 1978; area II was overtaken by area I in 1976 and in recent seasons i.e. 1979, 1980 and 1981; area III was at a consistently low level from 1971. This result could give some cause for concern because area II contains the best salmon fishing beach in the fishery i.e. Cheynes Beach, upon which usually 3 concessions operate (2 in 1981). Cheynes Beach has in the past had a large influence in terms of catch, upon the entire fishery. A lessening in this influence can only be interpreted as being due to fish availability, not to beach or weather conditions, as this beach is less influenced by the latter than any other beach in the fishery. Other beaches in area II never achieve anthing like the catch of Cheynes Beach in a season, many of them e.g. Bonito Point, Nanarup and Two People Bay, over the period considered, have on the average not managed to make economic catches overall. This situation becomes more common westwards i.e. in area III (Figure 1), and on the southwest coast.

THE AMATEUR SALMON CATCH, 1966/67 - 1980/81

Little information is available on the amateur salmon catch in this period, except that tag returns indicate that amateurs have exerted more effort in the 1970's than in the past. Amateur fishermen recovered: 24% of the recovered tags from 1975 west coast tagging experiments; 46% from 1976 west coast experiments; 13% from 1977 south coast experiments; and 40% from 1978 south coast experiments For all these tagging experiments together (3333 releases) there was an overall recovery of 31.2%, of which, 8.3% was made by amateurs. These tagging results indicate that the amateur catch is substantial, and give an idea of the required level of adjustment to the professional catch, in any one year, to obtain the total catch. It could be hypothesized that "the increase in amateur catch" in the 1970's, compared to the 1960's, could have been at the expense of the professional catch.

CATCH AND EFFORT IN THE SOUTH COAST PROFESSIONAL FISHERY AS INDICATED BY RESEARCH LOG BOOKS*

Research log books have been distributed to salmon fishermen since 1962. They were originally designed by CSIRO but were modified once since then following which they were redesigned for the current research programme i.e. 1974-1981. The current log book (Appendix 1) differs from the original one in that it collects less information about weather and sea conditions. Log books for the years 1962-1968 prior to the current research programme were located at CSIRO, Division of Fisheries Research at Cronulla, New South Wales and for the period 1969-1974 were held either by the W.A., Department of Fisheries or by fishermen themselves. It was possible during the current salmon programme to collect together all salmon log books available for examination and analysis.

Log books for the period 1962-1981 were examined and analysed by beach, area and the entire south coast for the months of February, March and April i.e. the major fishing months for salmon which have been defined as the salmon season. The number of days of beach observation (fished), hours fished, numbers of schools seen, numbers of schools netted, size of schools netted and the catch made were totalled for the whole south coast (Table 5). From these data the following parameters were calculated: (1) the number of days of beach observation/fished per log book examined; (2) the percentage of schools caught; (3) the number of schools sighted per day of beach observation; (4) the numbers of schools sighted per hour of beach observation; (5) the number of schools caught per day of beach observation; (6) the catch weight per beach observation day; and (7) the average school size caught (Table 5). These parameters were then graphed against time (Figures 6, 7, 8, 9, 10, 11 and 12).

* Log book data analyses are to be regarded as provisional, as data is to be reanalysed in future. It is anticipated that reanalyses will not produce any major changes in data or interpretation.

The number of days of beach observation per log book examined showed a similar level for the period since 1964 (Figure 6) and suggested that effort had been reasonably stable for the fishery, between 45 and 56 days a season.

The percentage of schools caught (Figure 7) was between 40% and 61%. There appeared to have been a slight increase in the period 1972-1981, except for the year 1979, which has been documented as being poor in terms of fishing conditions i.e. a lot of weed about.

The number of schools sighted per day of beach observation and per hour of beach observation (Figures 8 and 9) showed identical results with time. Between 1962 and 1970 from 0.58 to 0.83 schools were sighted per day and between 1971 and 1981 from 0.32 to 0.59 schools were sighted per day, an obvious decline in sightings.

The number of schools caught per day of beach observation (Figure 10) showed a slight downward trend with time. This was not as much as the decline in the number of schools observed over this period.

The catch per beach observation day (Figure 11) was at a higher level for the years 1962-1968 than 1969-1981. In the period, 1962-1968, the year 1963 was low and 1968 high. The period 1969-1981 was relatively stable in terms of catch per observation day.

The average school size caught (Figure 12) showed higher levels for the years 1962-68 than during 1969-1981.

In summary, log book data indicated that for the south coast salmon fishery for the period 1962-1981, effort in terms of days fished per team, had been constant, and that the percentage of schools caught had increased slightly over this time, of the order of about 10% (Table 5, Figure 7). The slight decrease for 1979 was caused by a series of bad storms early in the season which deposited large amounts of weed on beaches, making fishing conditions difficult. The level of the number of schools sighted in the 1970's was below that of the 1960's. This trend was seen whether the unit was day of beach observation or hour of beach observation and because of this the unit day of beach observation was chosen as a measure of effort. The catch per beach observation day was overall much higher in the period 1962-1968 than in the period 1969-1981, which was remarkably stable in this time. This result and the number of schools observed and/or caught demonstrate that the abundance of Australian salmon throughout the south coast fishery was much higher in the period 1962-1968, than in the interval 1969-1981. The average school size caught showed an identical picture to the catch per day, over the same period being between 4253 and 8283 kg in the period 1962-1968 and between 2247-4662 kg in the period 1969-1981. In the past, no obvious selection process, for either large or small schools, would appear to have occurred in the fishery. Today all schools able to be netted are taken. It is possible that there has been a change in school size as a consequence of a reduction in population size. To date

such a phenomenon has not been documented for fishes, birds and other animals and the result is worthy of further investigation. A similar situation did not arise with the Peruvian anchovetta when its population was reduced dramatically because of environmental and exploitation causes.

SUMMARY AND CONCLUSIONS ON THE STATE OF THE W.A. SALMON FISHERY

The Western Australian professional salmon fishery in the period 1975-1981 changed little in terms of mode of operation. Professional fishing effort for both south and west coast fisheries changed little in this period despite the slight reduction in the number of allocated beaches and concessions, as those lost in this time were of little or no importance. There was some transfer of concessions from father to son in this period and in some cases sons and families began to assist with and influence concession operation. Thus it is concluded in this period there was a trend for fishing effort to become more vigorous and effective.

Amateur fishing effort in the same period would appear to have increased because of better access to fishing locations, the use of 4 wheel drive vehicles and the provision of more time for leisure activities. The amateur fishery is composed of angling throughout the year, this being intensified during the spawning migration and trolling from power boats only during the migration. Most of the people who participate in the amateur fishery are from the south-west area. Amateurs, especially those using power boats, are known to disregard the bag limit of 5 fish per day.

The professional salmon catch declined over a four year period from the record levels of 1966/67 and 1967/68. For the last 9 seasons it has been at a lower level 754-1518 tonnes (average 1209). The south coast fishery showed an apparent change in catch distribution. Area I (Trigalow-Cape Riche) has taken over in order of importance from area II (Cheynes - Albany east). Generally there has ben a trend for catches to decline westwards in the fishery. Catches on the west coast have been poor in recent seasons, a situation which has caused the processor, who utilized its catch, to seek product from the south coast. This resulted in an overall better price for salmon to the fishermen. The present level of the salmon catch would appear to be not sufficient to satisfy the needs of two processors. The back run catch has declined in importance since 1967.

Analysis of south coast research logbooks for the period 1962-1981 indicated: that effort had been remarkably constant in the area over the period; that efficiency (i.e. % of schools caught) had increased by about 10% between the 1960's and 1970's; and that over the same period (i.e. 1960's: 1970's) sightings, catch per day of observation and the average school size had decreased.

ACKNOWLEDGEMENTS

I would like to thank the following personnel from Hunts Canning Company for provision of and assistance with factory receival catch data: Mr R. Hunt, Mr L. Welshman, Mr R. Welshman and Mrs G. Smith and from West Ocean Canning Company: Mr V. Kailis, Mr M. Thompson and Mr D. Feutril.

I thank salmon concession holders for completing log books with such patience since 1962 and for their free exchange of information concerning their personal operations and their fishery. Messrs J. Kelly, T. Froby, G. Roach and J. Breedon, all Fisheries Officers of the Department of Fisheries and Wildlife, are thanked for their assistance with research log book distribution and collection.

Mr S. Blight is thanked for his work asssociated with distribution and analysis of research log books, Mr I. Lethbridge for his assistance with the design and production of research log books and catch data analyses, Mr N. Hall for writing the computer programme to process catch receival data, and Mrs D. Clarke for processing and compilation of factory receival data and the exacting task of checking the manuscript of this report.

Dr D.A. Hancock is thanked for his review and criticism of the manuscript.

Mrs M. Isaacs and Miss J. Bentley typed this report and Mr M. Cliff drafted the figures.

TABLE 1 The number of concession holders and beaches to operate within the southern and southwestern salmon fisheries in the period 1975-1981.

Year	1975	1976	1977	1978	1979	1980	1981
No. of concessions to operate							
Southern fishery	26	26	25	24	24	24	23
South western fishery	17	17	16	15	13	14	13
Total concessions	43	43	41	39	37	38	36
No. of beaches to be fished							
Southern fishery	23	23	22	21	21	21	21
South western fishery	8	9	9	9	8	9	8
Total beaches	31	32	31	30	29	30	29

TABLE 2 W.A. salmon catch for the period 1966/67 to 1980/81 (kg live weight).

Year	West Coast	South Coast	Total W.A.
1966/67	909 091*	2 750 766	3 659 857
1967/68	1 363 636*	2 858 868	4 222 504
1968/69	665 613	1 627 281	2 292 894
1969/70	366 119	1 952 067	2 318 186
1970/71	372 052	1 123 215	1 495 267
1971/72	642 228	1 150 137	1 792 365
1972/73	262 843	901 371	1 164 214
1973/74	501 188	754 802	1 255 990
1974/75	340 933	941 786	1 282 719
1975/76	176 888	909 227	1 086 115
1976/77	119 000	1 398 830	1 517 830
1977/78	27 000	727 548	754 548
1978/79	137 000	1 054 177	1 191 177
1979/80	128 000	1 132 086	1 260 086
1980/81	164 829	1 208 455	1 373 284

*Estimate of catch.

TABLE 3 South coast salmon catch by month 1967-1981 (kg live weight).

MONTH	JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	TOTAL
YEAR													
1967	58 828	177 528	1 717 386	145 386	112 281	227 901	145 707	115 119	5 050	1 800	14 916	28 864	2 750 766
1968	63 841	257 493	1 944 676	473 906	43 726	12 340	19 046	20 598	–	–	–	23 242	2 858 868
1969	42 560	341 703	1 109 473	92 143	13 134	1 186	386	4 399	–	4 819	17 478	–	1 627 281
1970	14 597	182 914	1 245 576	151 912	15 296	104 305	79 595	80 467	8 300	68 812	293	–	1 952 067
1971	58 739	53 457	793 363	112 123	16 306	61 986	19 322	6 388	1 055	–	476	–	1 123 215
1972	–	120 940	918 175	99 756	2 086	–	2 823	3 958	–	–	2 399	–	1 150 137
1973	–	24 369	802 665	74 337	–	–	–	–	–	–	–	–	901 371
1974	129	145 811	473 470	135 392	–	–	–	–	–	–	–	–	754 802
1975	37 370	89 018	726 865	79 964	1 045	6 726	–	570	228	–	–	–	941 786
1976	42 545	19 222	767 415	69 145	–	–	–	5 490	750	–	–	4 660	909 227
1977	6 715	129 720	1 175 345	73 840	–	–	13 210	–	–	–	–	–	1 398 830
1978	6 912	79 003	543 248	38 795	3 900	6 420	–	–	–	5 000	44 270	–	727 548
1979	8 982	18 669	862 540	152 126	8 022	–	–	–	–	–	2 100	1 738	1 054 177
1980	–	107 280	859 079	163 021	2 706	–	–	–	–	–	–	–	1 132 086
1981	1 528	84 108	986 784	136 035	–	–	–	–	–	–	–	–	1 208 455

TABLE 4 South coast salmon catch by area 1967-1981 (kg live weight).

Year	Area I	Area II	Area III	Area Unknown (South Coast)	Total
1967	857 746	1 443 126	417 948	31 946	2 750 766
1968	1 022 274	1 396 853	439 741	-	2 858 868
1969	510 083	711 192	406 006	-	1 627 281
1970	437 605	987 414	527 048	-	1 952 067
1971	367 142	489 986	257 934	8 153	1 123 215
1972	525 298	355 064	269 665	110	1 150 137
1973	289 081	391 898	220 392	-	901 371
1974	212 761	404 088	137 953	-	754 802
1975	346 677	401 588	192 460	1 061	941 786
1976	468 364	318 119	122 726	18	909 227
1977	519 351	650 395	228 784	300	1 398 830
1978	194 932	378 881	153 735	-	727 548
1979	473 285	332 926	247 966	-	1 054 177
1980	547 713	350 146	234 227	-	1 132 086
1981	606 862	385 720	215 873	-	1 208 455

TABLE 5 Summary of log book data and calculated parameters south coast salmon fishery 1962-1981

YEAR	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
RAW DATA										
No. of log books examined	15	14	15	14	13	12	11	4	15	16
No. of days fished (beach observation)	670	790	671	763	645	640	612	208	783	758
No. of hours fished (beach observation)	8070¾	9859½	7991	9143½	7620¾	7874¼	7390¾	2636	9242	9411
No. of schools sighted	473	459	554	504	505	452	485	144	490	363
No. of schools caught	219	188	244	258	256	196	214	57	254	176
Catch whole fish in kg	1509929	799576	1482702	1284558	1533321	1414624	1772460	128080	1153096	698203
CALCULATED PARAMETERS										
No. of days fished per log book examined	44.7	56.4	44.7	54.5	49.6	53.3	55.6	52.0	52.2	47.4
Percentage of schools caught	46.3	41.0	44.0	51.2	50.7	43.4	44.1	39.6	51.9	48.5
No. of schools sighted per day of beach observation	0.71	0.58	0.83	0.66	0.78	0.71	0.79	0.69	0.63	0.48
No. of schools sighted per hour of beach observation	0.059	0.047	0.069	0.055	0.066	0.057	0.066	0.055	0.053	0.039
No. of schools caught per day of beach observation	0.33	0.24	0.36	0.34	0.40	0.31	0.35	0.27	0.32	0.23
Catch per day of beach observation (kg)	2254	1012	2210	1684	2377	2210	2896	616	1473	921
Average school size caught (kg)	6895	4253	6077	4979	5990	7217	8283	2247	4540	3967

TABLE 5 (continued)

YEAR	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
RAW DATA										
No. of log books examined	12	13	9	13	20	18	14	14	18	19
No. of days fished (beach observation)	598	620	436	614	1023	930	709	672	921	886
No. of hours fished (beach observation)	7248¼	7342¾	5115½	6746¾	12682	11110	8589¼	7070½	11432¾	10993
No. of schools sighted	285	322	139	367	395	487	239	361	399	492
No. of schools caught	154	181	77	202	224	278	129	169	244	279
Catch whole fish in kg	672618	630651	358970	689438	780258	1251811	521072	767767	919427	898827
CALCULATED PARAMETERS										
No. of days fished per log book examined	49.8	47.7	48.4	47.2	51.2	51.7	50.6	48.0	51.2	46.6
Percentage of schools caught	54.0	56.2	55.4	55.0	56.7	57.0	54.0	46.8	61.2	56.7
No. of schools sighted per day of beach observation	0.48	0.52	0.32	0.59	0.39	0.52	0.34	0.54	0.43	0.56
No. of schools sighted per hour of beach observation	0.039	0.044	0.027	0.054	0.031	0.044	0.028	0.051	0.035	0.044
No. of schools caught per day of beach observation	0.26	0.29	0.18	0.33	0.22	0.30	0.19	0.25	0.26	0.31
Catch per day of beach observation (kg)	1125	1017	823	1123	763	1346	735	1143	998	1014
Average school size caught (kg)	4368	3484	4662	3413	3483	4503	4039	4543	3768	3222

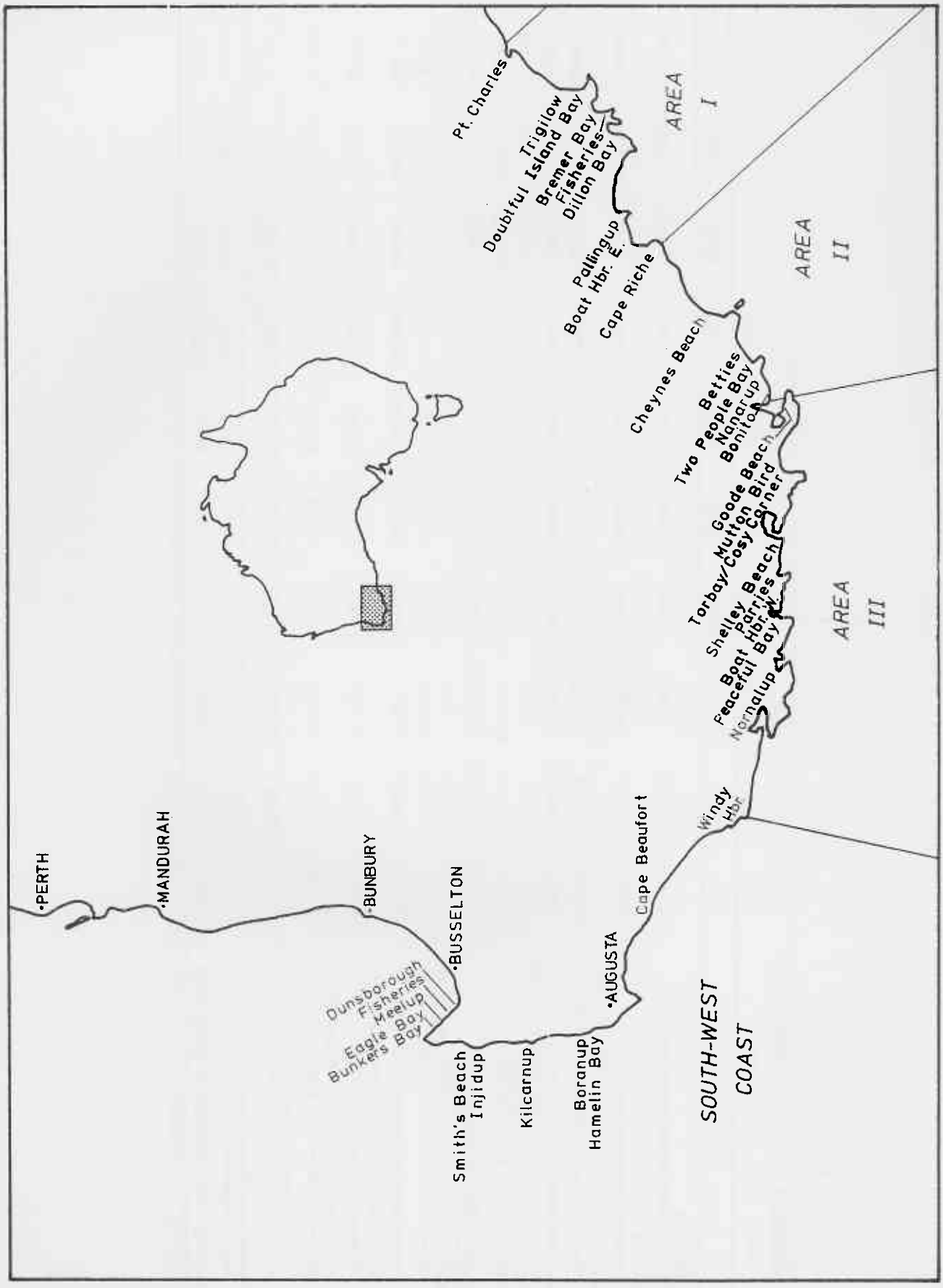

FIGURE 1 W.A. salmon beaches and the areas to which they belong.

FIGURE 2 W.A. salmon catch for the period 1966/67 to 1980/81 (tonnes live weight)

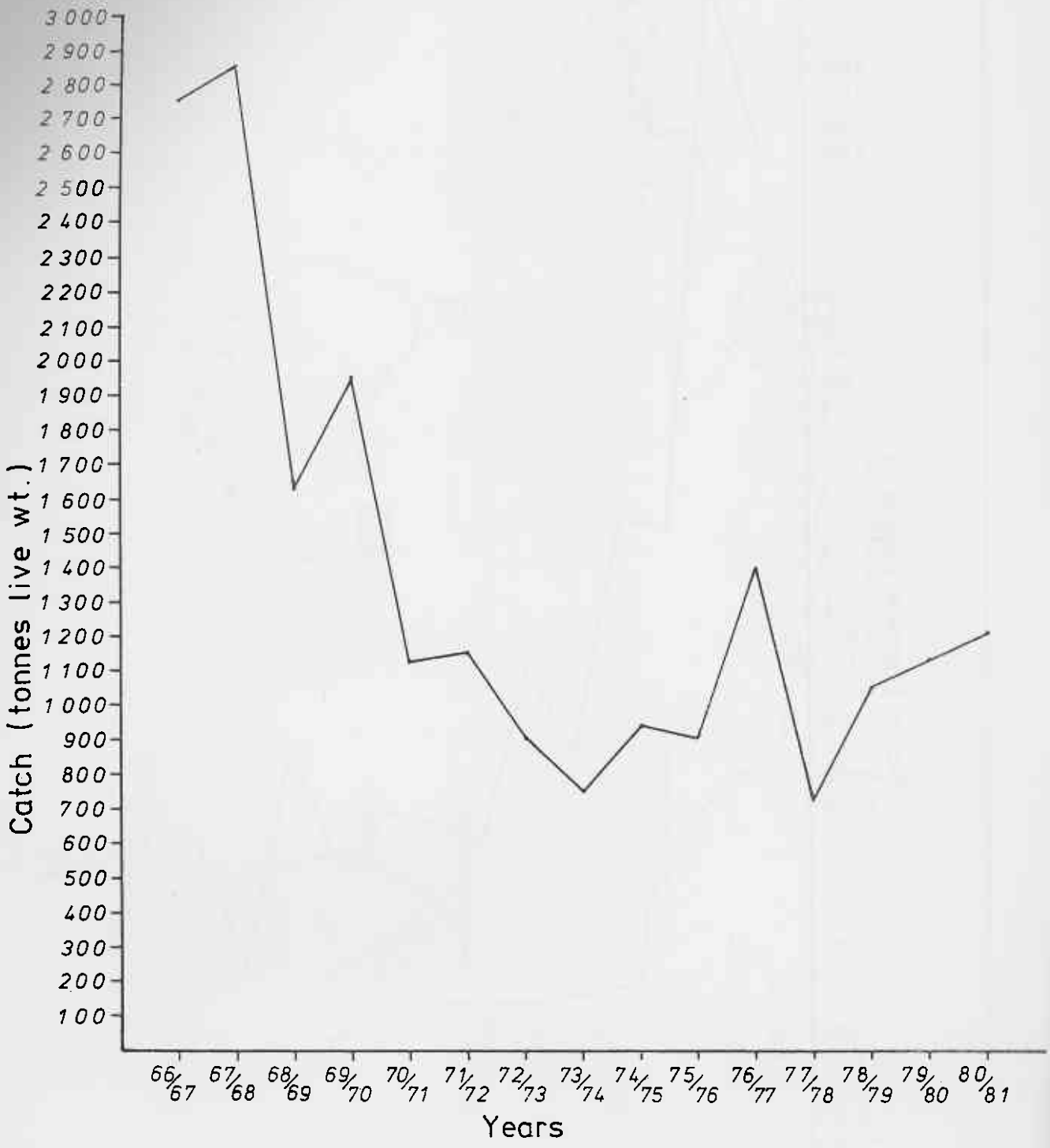

FIGURE 3 South coast salmon catch for the period 1966/67 to 1980/81 (tonnes live weight).

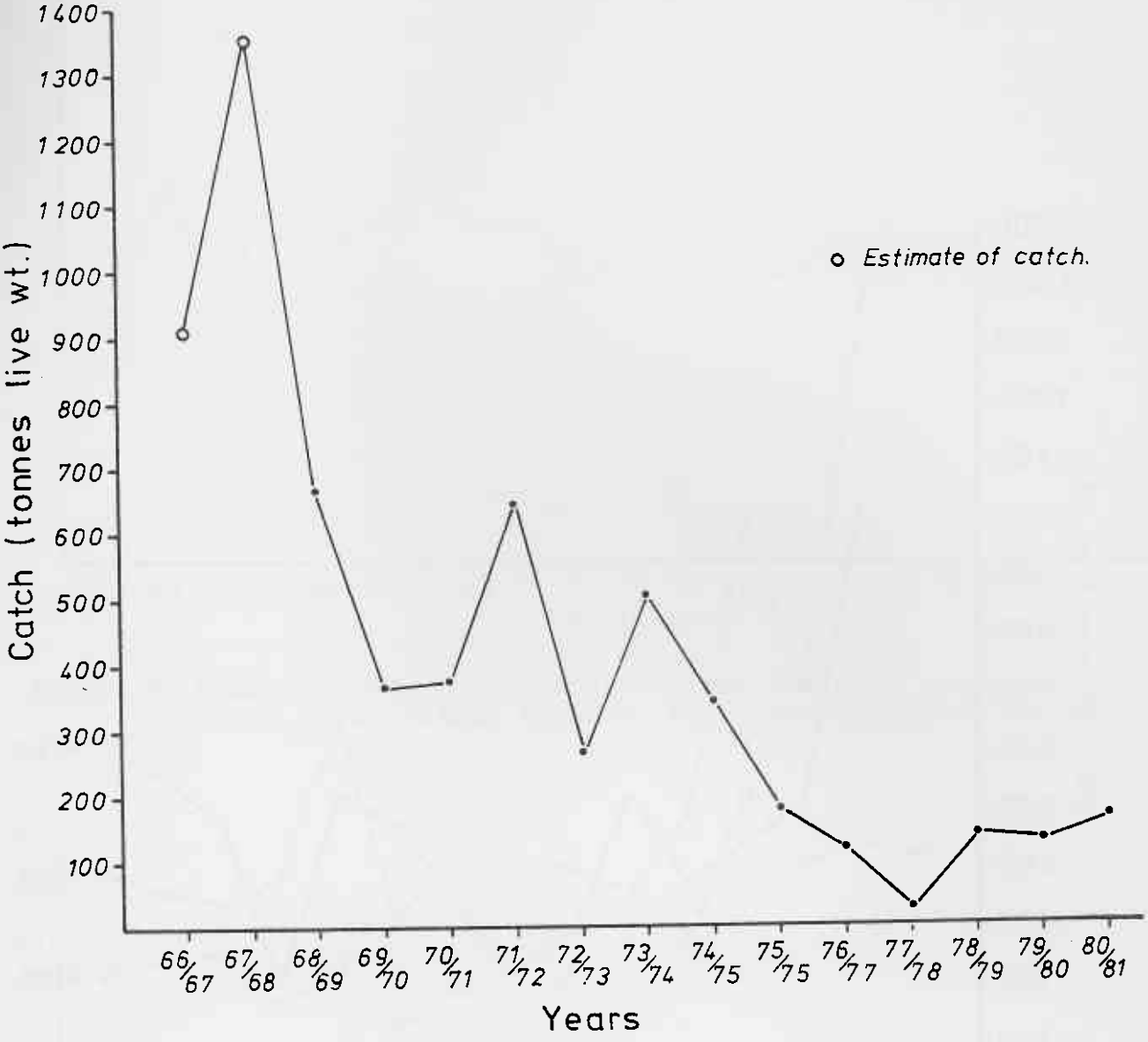

FIGURE 4 West coast salmon catch for the period 1966/67 to 1980/81 (tonnes live weight).

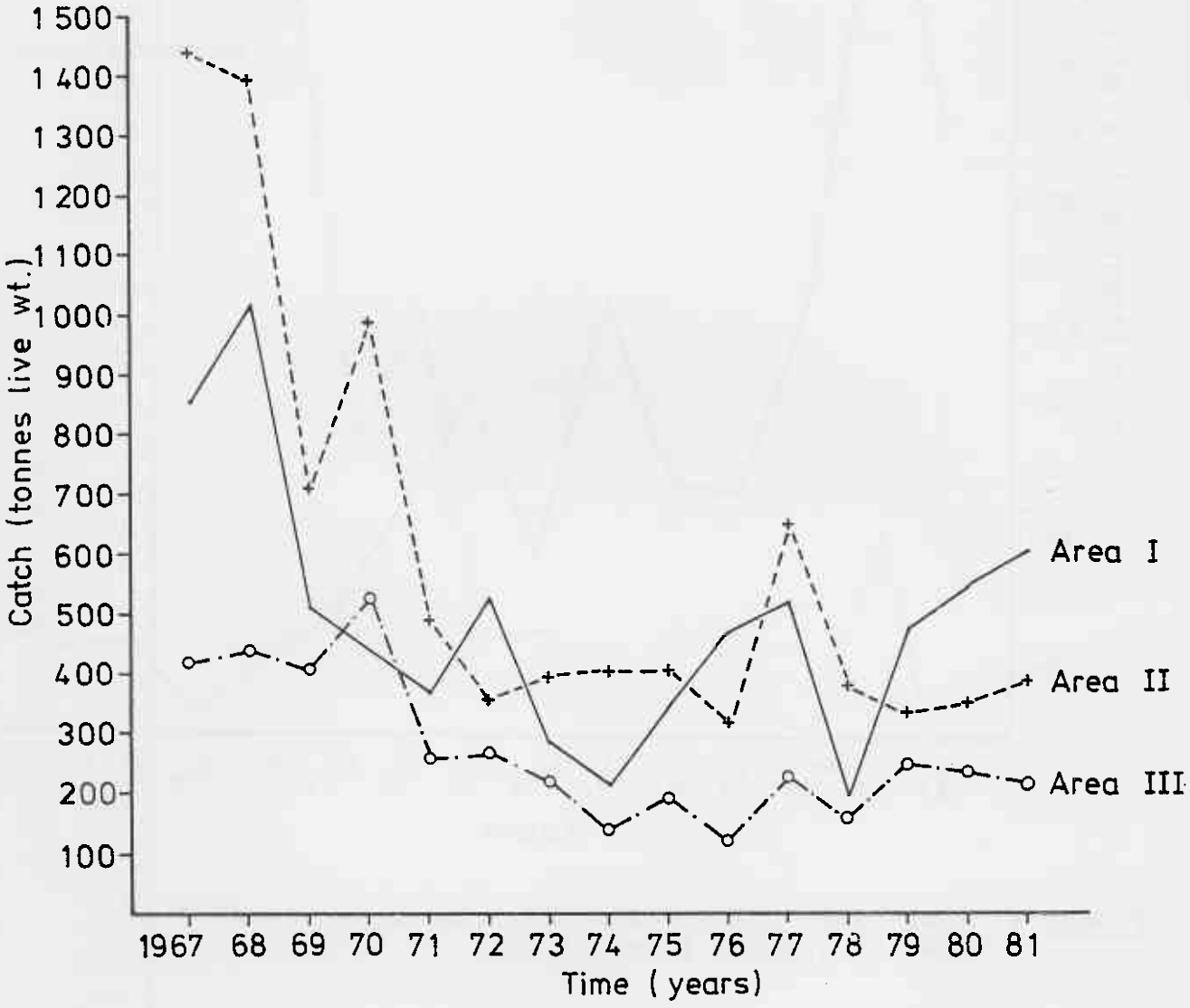

FIGURE 5 South coast salmon catch by area for the period 1967 to 1981 (tonnes live weight.)

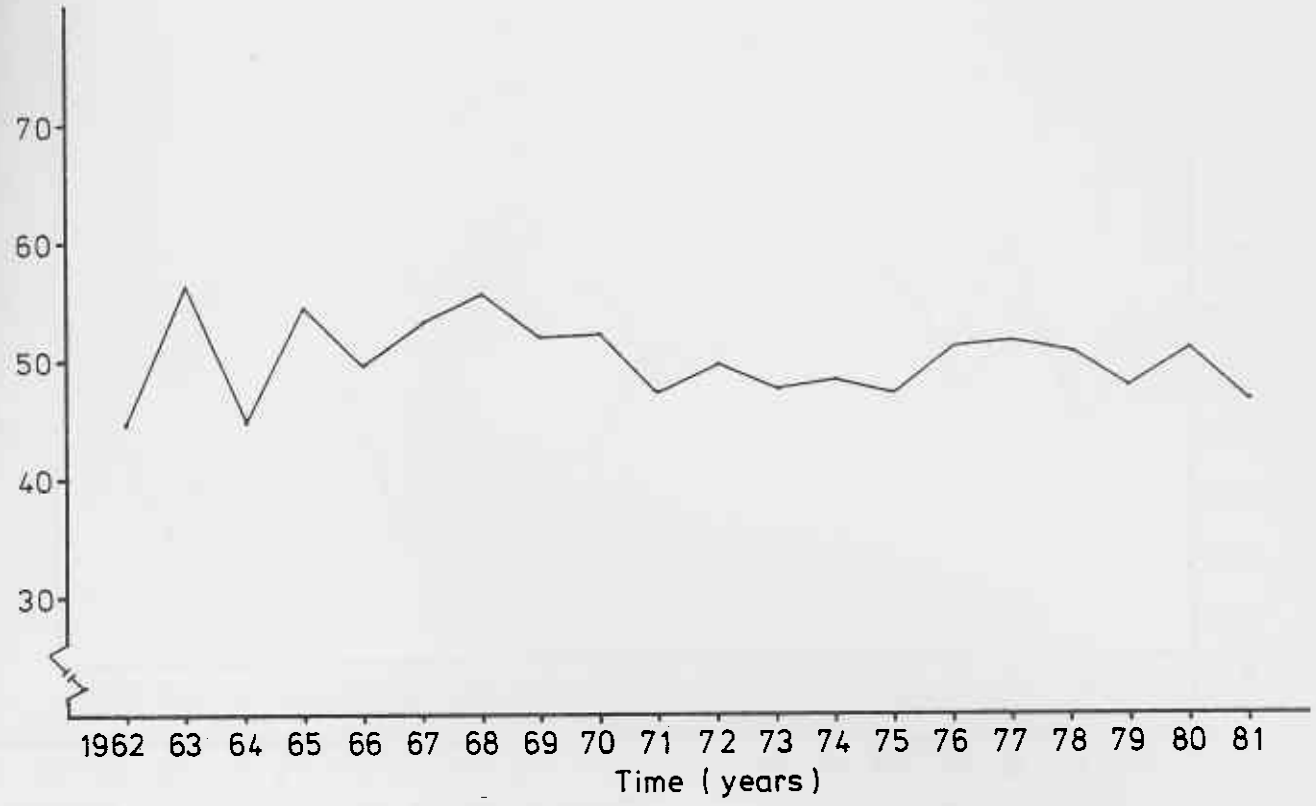

FIGURE 6 Number of days beach observed per log book examined. South coast salmon fishery, Point Charles-Windy Harbour

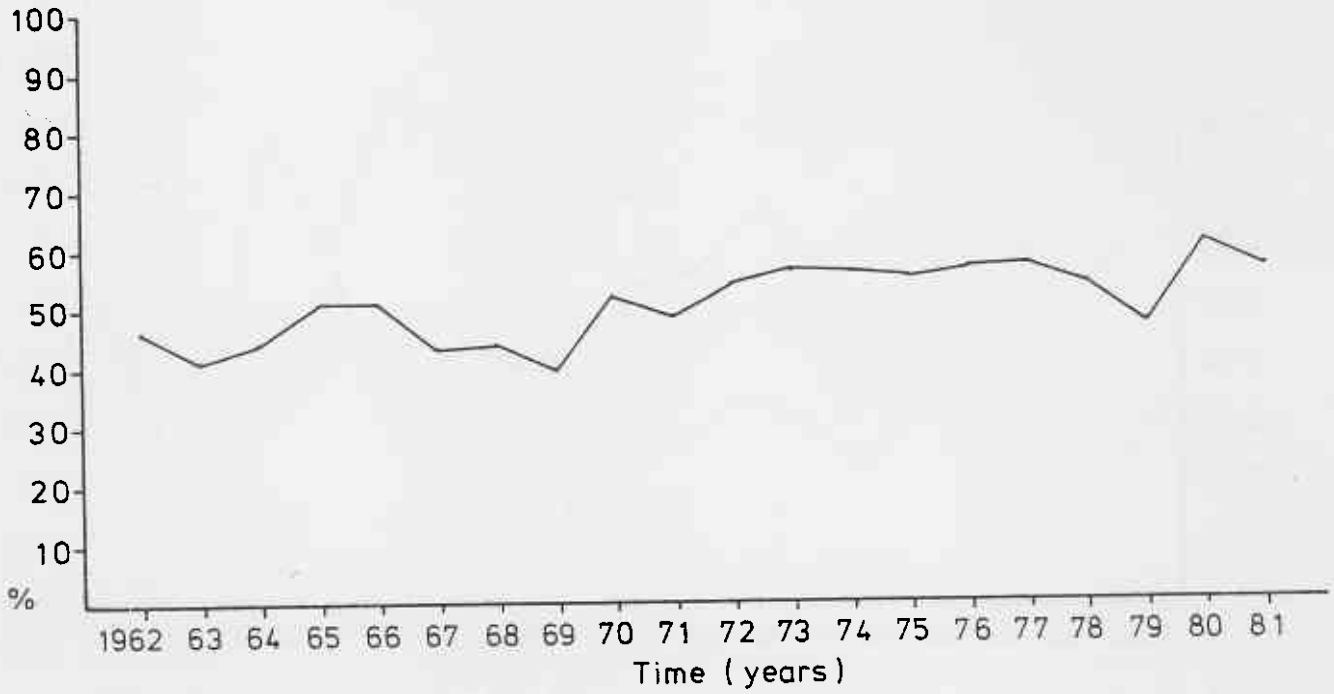

FIGURE 7 Percentage schools caught. South coast salmon fishery, Point Charles-Windy Harbour.

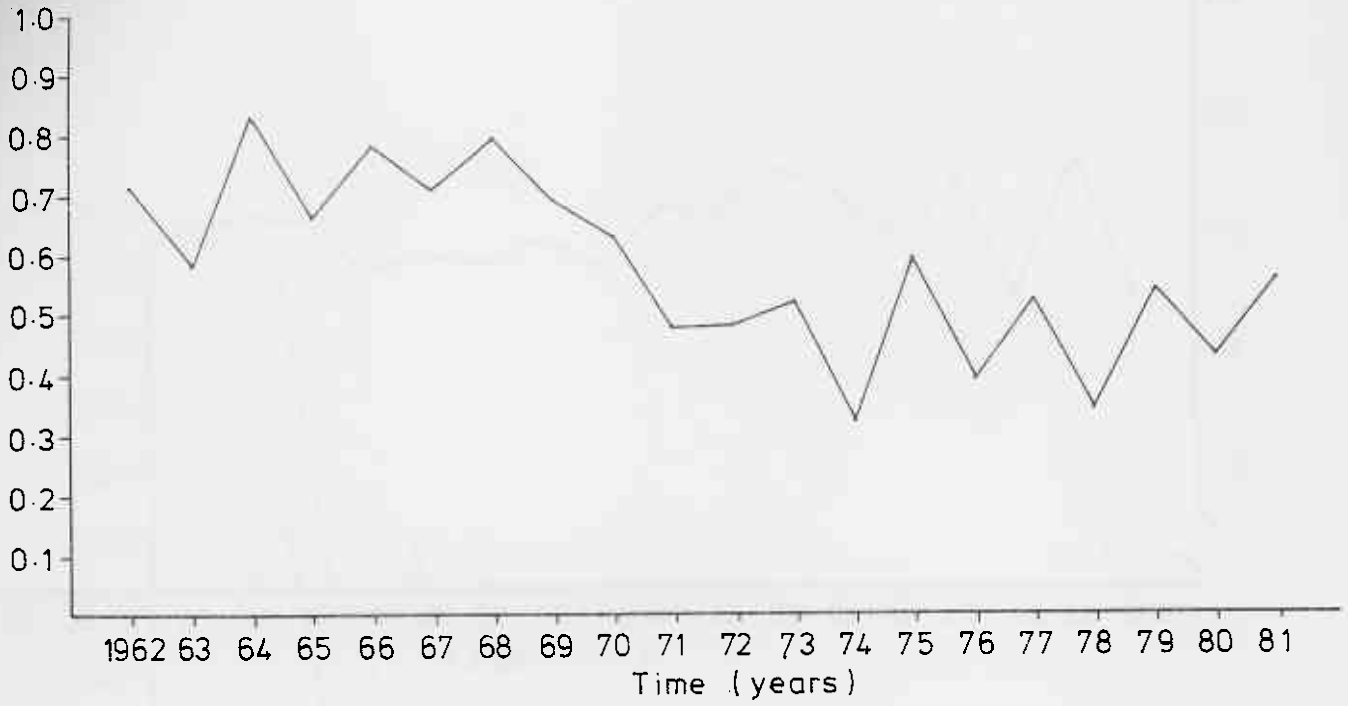

FIGURE 8 Number of schools sighted per day of beach observation. South coast salmon fishery, Point Charles-Windy Harbour.

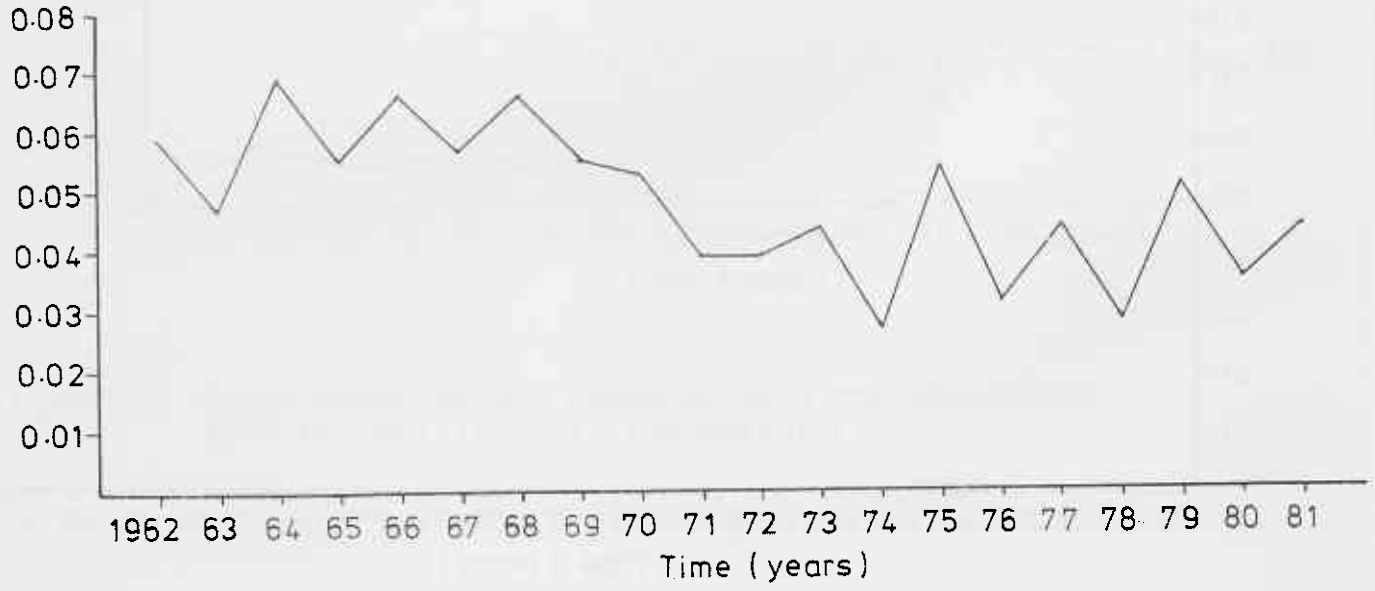

FIGURE 9 Number of schools sighted per hour of beach observation. South coast salmon fishery, Point Charles-Windy Harbour.

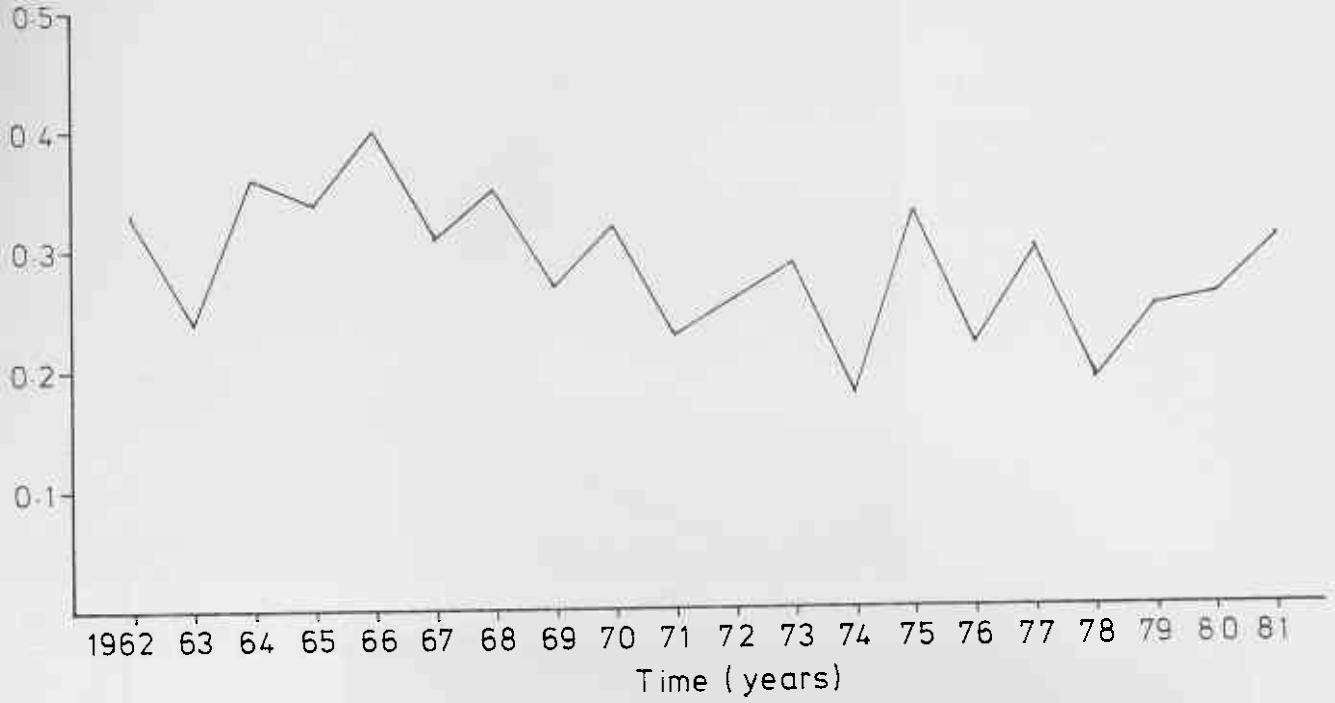

FIGURE 10 Number of schools caught per day of beach observation. South coast salmon fishery, Point Charles-Windy Harbour.

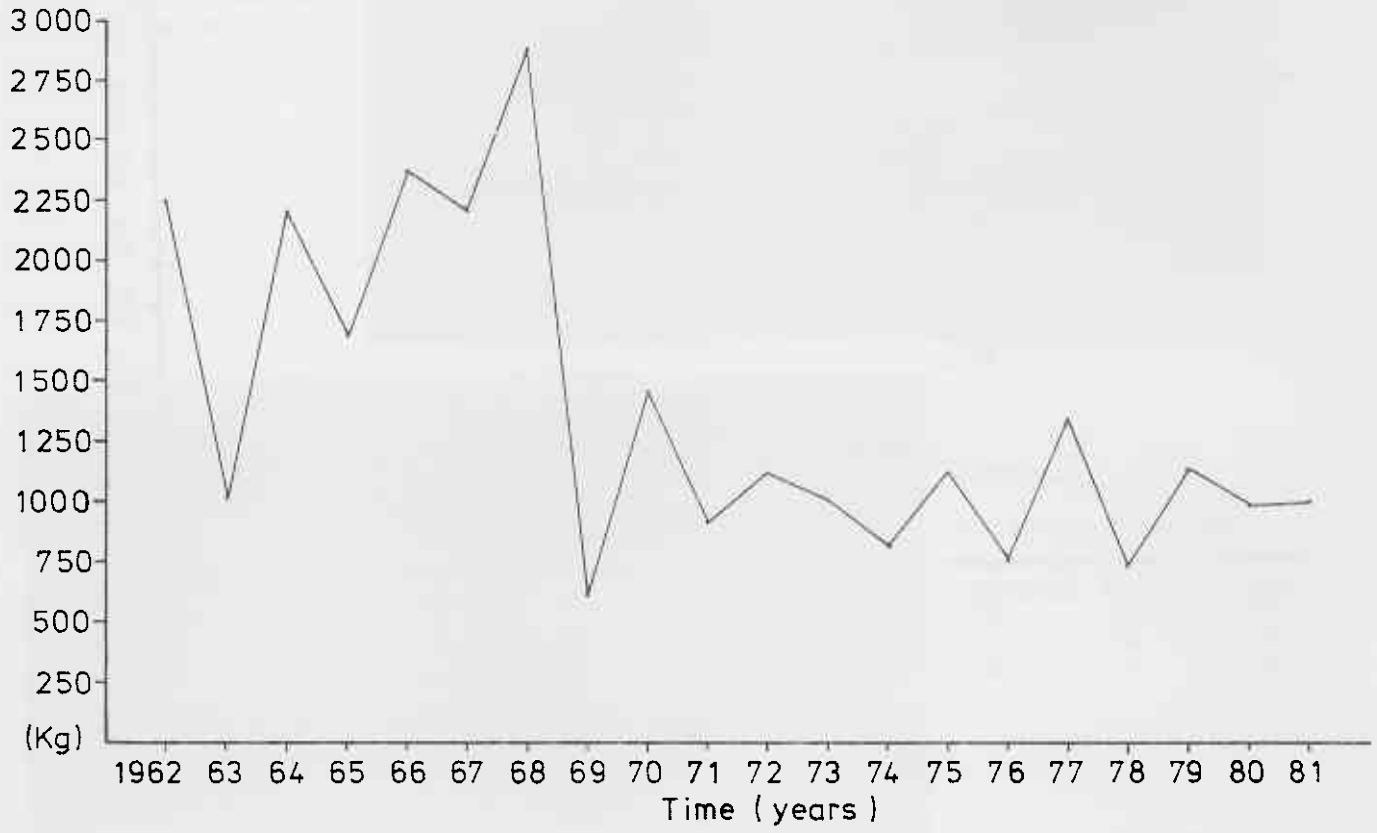

FIGURE 11 Catch (kg) per day of beach observation. South coast salmon fishery, Point Charles-Windy Harbour.

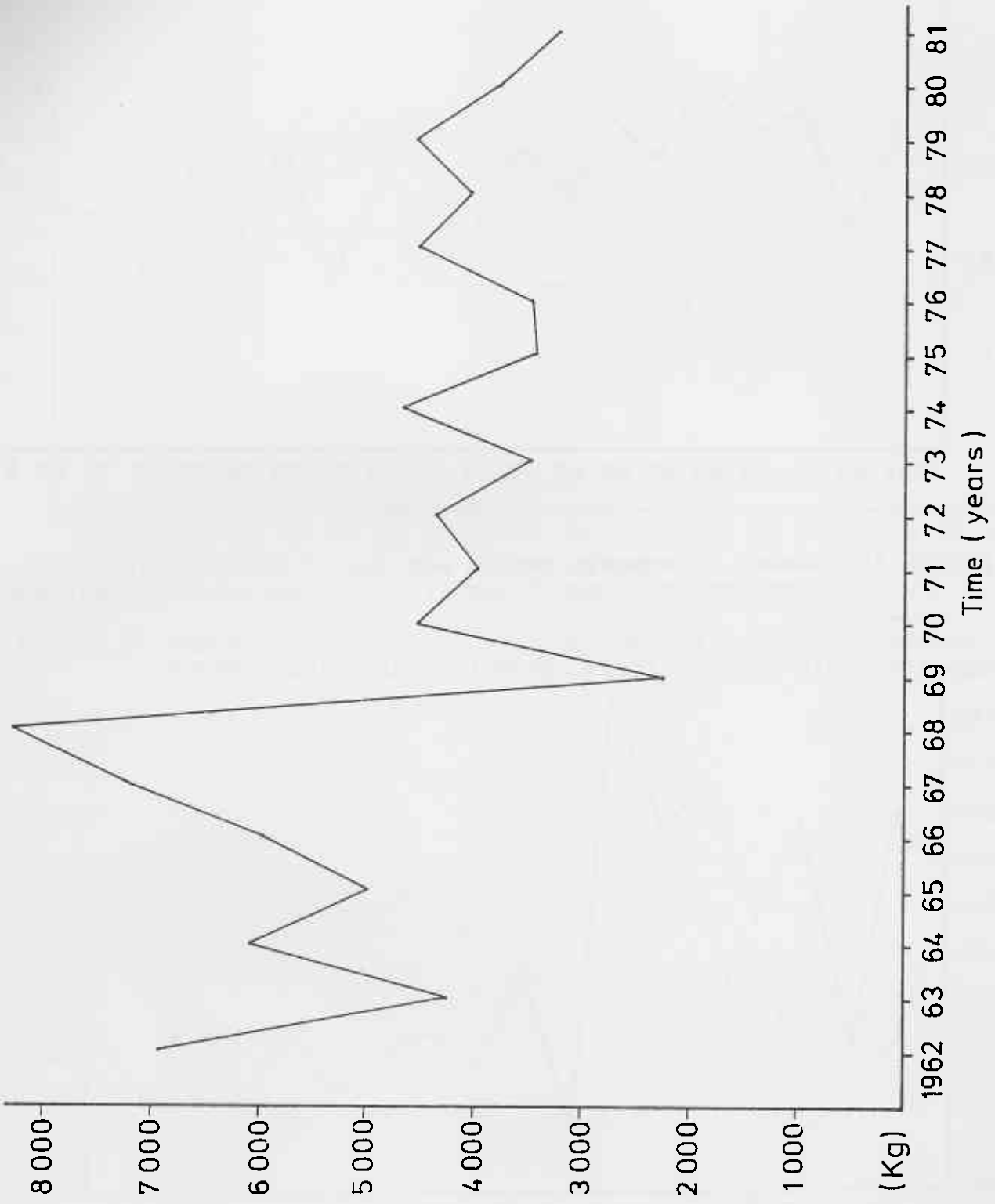

FIGURE 12 Average school size caught. South coast salmon fishery, Point Charles-Windy Harbour.

PLATE 1

Salmon school travelling along a beach.

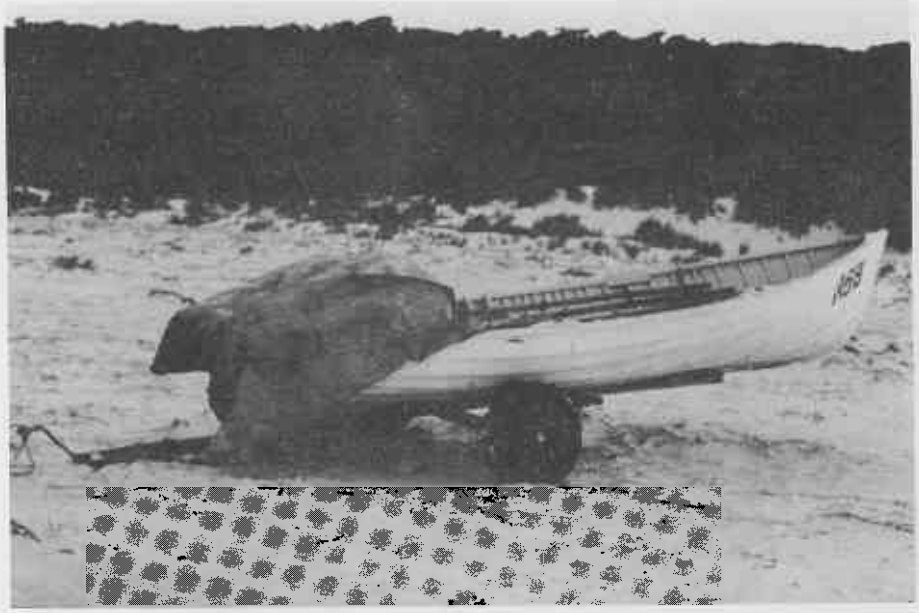

PLATE 2

Net boat stationed on a beach and ready to be used to net salmon.

PLATE 3

Netting a salmon school, Boat Harbour East, 1979.

PLATE 4

Final stages of hauling, Cheynes Beach 1980.

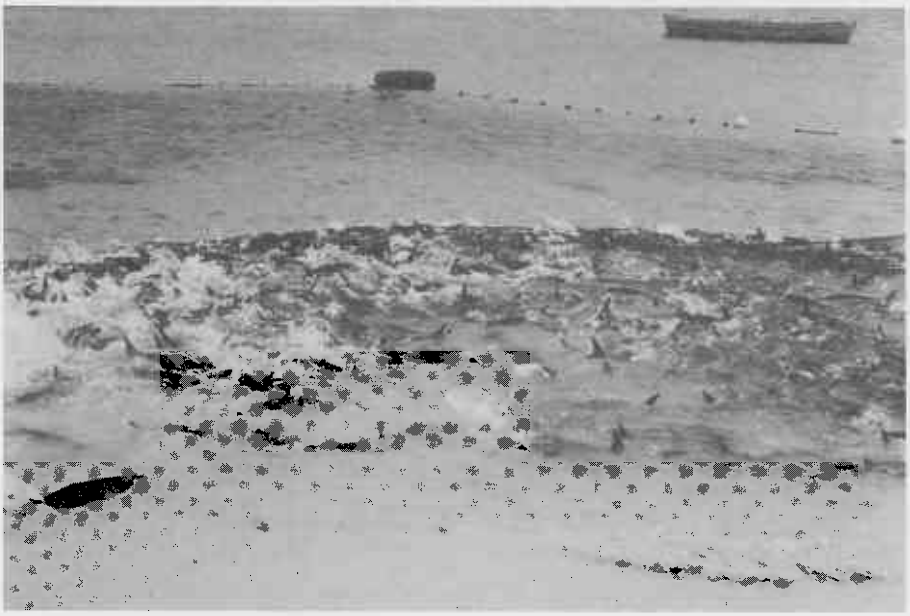

PLATE 5

Salmon being hauled onto the beach.

PLATE 6

Removal of netted salmon from a net by hand.

PLATE 7

Conveyors may sometimes be used to remove fish from the net.

PLATE 8

Heading and gutting salmon, Bremer Bay, 1977.

PLATE 9

Loading salmon onto a truck for transport to the factory.

APPENDIX 1 Salmon research log sheet, as used by salmon fishermen, 1975-1981.

SEINE FISHING LOG SHEET

DATE: ___/___/19___	AREA(S) OF OPERATION:
FISHING CONDITIONS:	

FISHING OBSERVATIONS AND FISHING RECORD

BEACH – LOCALITY	TIME SEARCHING COMMENCED	TIME SEARCHING CEASED

TIME SCHOOL SIGHTED & BEACH LOCALITY	FISH TYPE	ESTIMATED SIZE OF SCHOOL	BEHAVIOUR OF SCHOOL

TIME NET SHOT	CANNERY WT. OR NUMBER	REASON(S) WHY NET NOT SHOT OR SCHOOL NOT CAUGHT.

REMARKS:

18819/4/82—1M—L/3210

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