RESOURCE ALLOCATION IN THE SOUTH AUSTRALIAN MARINE SCALEFISH FISHERY

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93/249 Quantification of the resource allocation in the South Australian Marine Scalefish Fishery

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OBJECTIVES:

1) To quantify, spatially and temporally, recreational catch and effort for species of common interest to the recreational and commercial sectors.

2) To use the information gained in 1) to provide information to assist in the resolution of conflicts and facilitate the implementation of equitable and rational management strategies.

3) To disseminate the technical requirements for undertaking large-scale surveys using the bus-route methodology to other Australian researchers.

NON-TECHNICAL SUMMARY

This project was initiated to address the lack of comprehensive recreational fishery information in South Australia which was hindering equitable management of the Marine Scalefish Fishery. Comprehensive data collection in the recreational boat fishery has not previously been cost-effective due to the resource requirements for conducting surveys over large areas. However, the development and validation of a new technique (known colloquially as the "bus-route method") allowed surveys to be undertaken over most of the coastline of South Australia with a small number of personnel.

The bus-route method requires survey agents to travel around a circuit of boat ramps on each sampling day. The circuit is pre-determined and uses fixed travel times between ramps followed by fixed waiting periods at each ramp. Fishing effort is calculated for the ramps covered by the circuit through a calculation based on the number of boat trailers observed during the day. Other information (e.g. catch rates, species caught, area fished, etc) is recorded from interviews with anglers returning to the boat ramp during waiting times.

The survey covered 74 boat ramps from Victor Harbour to Ceduna from April 1994 to March 1996. The survey area was divided into 2 broad regions: 1) Gulf St Vincent and 2) Spencer Gulf & West Coast. Each region was surveyed for a 12 month period. In total, 631 days were sampled and 3,513 interviews recorded.

The results showed that nearly 1 million boathours (or 200,000 boatdays) were expended on recreational fishing during the survey. Just over half of this was expended in Gulf St Vincent, about 40% in Spencer Gulf and 5% in West Coast waters. This total was about 3.7 times the number of days that the commercial fishery fished during the same period.

An analysis of the target species of the commercial and recreational fishery showed that considerable overlap existed between the sectors with King George whiting and garfish in all waters. In addition, conflicts could be expected for calamary, blue swimmer crabs and snapper in Gulf waters.

At least 80 species of fish (including crabs and molluscs) were recorded in the recreational catch. The dominant species were King George whiting (28.2% of recorded numbers), garfish (20.14%), blue swimmer crabs (15.06%) and tommy ruff (10.55%). Together, these four species accounted for about 75% of the observed catch.

The total estimated annual harvest of the recreational fishery was 3,770,256 fish (excluding scallops, cockles, mussels and razorfish). The estimated recreational harvests of nine of the main species, along with comparisons with the commercial catch during the same period, are shown in Table a.

The project has successfully collected comprehensive information for the marine boat fishery in South Australia. This information provides the basis for equitable management of the fishery, founded on knowledge of the current resource sharing arrangements. However, uncertainty remains for species where a significant shore-based fishery exists. Further, fishing effort, catch rates and harvest are likely to change over time and the need to implement an ongoing monitoring programme remains an issue.

The results of this project will greatly assist the design of future surveys to explicitly address issues for individual species or areas. The results clearly show where sampling needs to be directed both spatially and temporally. Future surveys of this magnitude could produce estimates with greater precision by allocating more sampling effort to seasons and areas with the greatest variability.

The precision levels obtained in this study were encouraging given the large spatial scale of the study area and the inherent variability in recreational fishery data, and thus support the efficacy of the bus-route method. Such high precision will enable long-term trends and/or changes in recreational effort, HPUE and harvest to be more readily detected.

Table a. Summary of resource sharing in the South Australian Marine Scalefish Fishery: Gulf St Vincent (April 1994 to March 1995) and Spencer Gulf & West Coast (April 1995 to March 1996)

Species	**Recreational (tonnes)**	**Commercial (tonnes)**	**Total (tonnes)**	**Recreational share (%)**
King George whiting	269.9	513.7	783.6	34.4
Sea garfish	64.1	425.6	489.7	13.1
Calamary	82.8	353.6	436.4	19.0
Blue swimmer crab	161.2	609.9	771.1	20.9
Aust herring (tommy ruff)	35.6	237.6	273.2	13.0
Snook	49.8	143.8	193.6	25.7
Aust salmon	16.9	343.7	360.6	4.7
Snapper	48.0	282.0	330.0	14.5
Blue mackerel	15.5	5.2	20.7	74.9

KEYWORDS: Resource sharing, recreational fishery, bus-route survey, creel survey

SCOPE OF THIS REPORT

This report represents the Final Report to the Fisheries Research and Development Corporation for the project titled "Quantification of resource allocation in the South Australian Marine Scalefish Fishery" (Project No 93/249).

The major component of the study was an extensive recreational fishery survey of marine boat angling throughout most of the State's coastal waters. Recreational surveys of this nature collect a large volume of information on many aspects of fishing activity. This Report presents only that information which is relevant to the primary question addressed - resource allocation. Information which is external to that question has not been included but will be published in later reports.

It must be further emphasised that the survey addressed boat fishing only. Some species (notably Australian salmon and herring, southern calamary and blue swimmer crabs) are caught by shore and jetty anglers in significant but unquantified numbers.

The commercial fishery data have been extracted from the GARFIS catch and effort statistical database held by SARDI. To maintain the confidentiality of individual fisher's information, commercial fishery data can not be published except in aggregated form. In many cases, therefore, the recreational and commercial catches in several MSF Blocks have been aggregated in the comparative tables.

The study periods during this investigation were April 1st 1994 to March 31st 1995 for Gulf St Vincent and April 1st 1995 to March 31st 1996 for Spencer Gulf and West Coast waters. Commercial fishery data were collated for the same periods and therefore will not correspond to published data for the 1994/95 and 1995/96 financial years.

BACKGROUND

Proper management of a fishery requires information on all sectors utilising the resource. In the South Australian Marine Scalefish Fishery, direct competition occurs between the two primary user groups - commercial and recreational fishers. In many local coastal waters, both sectors fish the same grounds for the same species. This has led to continuing and increasing conflict over resource allocation.

Management of the fishery is currently based on an implicit equal allocation of the resource. Changes to this management regime are hindered by dispute over the relative catch of the recreational sector and there are inadequate data available for resolving these conflicts. This situation has arisen as a result of the fact that there has been no cost-effective method of obtaining recreational fishing data on geographically large fisheries such as those which exist in South Australian marine waters. However, a recent theoretical development has provided a means for undertaking large-scale surveys using a small team of roving personnel. The method was rigorously validated and tested and this project sought to implement the method in both South Australian Gulfs over a two year period.

NEED

There is an urgent need to collect statistically accurate quantitative data on recreational fishing effort and catches of important marine scalefish species to use in the framing of management plans for this fishery.

OBJECTIVES

1) To quantify, spatially and temporally, recreational catch and effort for species of common interest to the recreational and commercial sectors.

2) To use the information gained in 1) to provide information to assist in the resolution of conflicts and facilitate the implementation of equitable and rational management strategies.

3) To disseminate the technical requirements for undertaking large-scale surveys using the bus-route methodology to other Australian researchers.

METHODS

The bus-route method of sampling recreational fisheries was first described and developed by Robson and Jones (1989) and Jones *et al*. (1990). Clear instructions on the design and conduct of a bus-route survey can be found in Pollock *et al*. (1994). In brief, the creel survey is conducted in a manner analogous to a bus-route. The survey agents travel around a circuit of access sites (e.g. boat ramps) in a pre-determined order with known travel times between sites. At each site, the survey agents remain for a fixed time and conduct interviews with anglers before departing for the next site.

1. SPATIAL AND TEMPORAL STRATIFICATION

The recreational boat fishery of South Australia extends along the entire coast from the Victorian border (38^0 3'S, 140^0 59'W) to areas beyond Ceduna (32^0 3'S, 133^0 40'S). However, the greatest concentration of recreational boat fishing effort occurs in the two Gulfs, Investigator Strait and waters along the western coast of Eyre

Peninsula (Jones 1981; Philipson *et al.* 1986). The study area was therefore defined as the coastal waters between Victor Harbour and Ceduna (Fig. 1).

For logistical reasons, the study area was divided into two regions which were each sampled for a 12 month period. The first region was broadly defined as Gulf St Vincent and extended from Victor Harbour to Gleesons Landing (Figs. 1 and 2). The second region encompassed Spencer Gulf waters from Corny Point to Taylors Landing and West Coast waters from Coffin Bay to Ceduna (Figs. 1, 3 and 4).

The bus-route sampling method was extensively tested and validated in the South Australian fishery before the current project commenced (McGlennon and Kinloch, 1993, ms sub; Kinloch *et al.*, ms sub). During that process, important boat launching sites were identified in Gulf St Vincent and sampling circuits (designated as Routes in this report) were defined. Three criteria were used when defining Routes (McGlennon and Kinloch, ms sub): (i) logistical considerations such as geographic layout and the proximity of ramps to one another; (ii) homogeneity of fishing effort and catch rates within Routes and (iii) the need to match recreational fishery sampling routes with the statistical reporting blocks for the commercial marine scalefish fishery (designated MSF Blocks in this report) in order to facilitate comparisons between the two sectors at the same spatial scales. As a result of these considerations, 12 individual Routes were delineated - four in Gulf St Vincent, six in Spencer Gulf and two on the West Coast. Coastline lengths within each Route ranged approximately from 40 - 170 km and included between 4 and 9 ramps (Figs. 2, 3 and 4; Table 1).

Some access sites within a Route were only used seasonally - particularly those which were beach launches and subject to strong onshore weather conditions during winter, or those close to holiday "shack" communities. In such cases, these access sites were removed from the Route during the "off" seasons and wait times were increased at the remaining sites. In other cases, two or three adjacent sites yielding low but similar effort were visited on alternate sampling days (within a season) in an attempt to cover any differences in catch patterns between the sites.

The Gulf St Vincent region was sampled from April 1st 1994 to March 31st 1995, and the Spencer Gulf/West Coast region was sampled from April 1st 1995 to March 1996. Each 12 month period was further stratified into six seasons based on historical data from the fishery (Table 2). This temporal stratification aimed to divide the year into seasons within which fishing effort and/or HPUE was relatively homogeneous.

2. SAMPLING DESIGN

Each Route was sampled independently, with the number of sampling days within the 12 months ranging from 30 to 68 (Table 2). In general, more sampling days were allocated to Routes with higher fishing effort. Within each Route, seasonal strata were also sampled independently with the number of sampling days ranging from 4 to 16 (Table 2). The number of sampling days for each seasonal stratum in Gulf St Vincent was initially derived from an optimal sampling allocation simulation using historical data (McGlennon and Kinloch, ms sub). Seasonal sampling effort in Spencer Gulf and West Coast Routes was then based on the precision of Gulf St Vincent results combined with estimates of expected fishing effort.

Within each season, sampling days were randomly chosen (without replacement) for each Route without daytype (weekday/weekend) stratification, as improvements to precision of the harvest estimates from this stratification were considered to be small (McGlennon and Kinloch, ms sub). After sampling dates were selected, days were allocated as morning or afternoon shifts with a general probability of between 1:2 and 1:3 respectively. The unequal probabilities were aimed at increasing the number of interviews obtained (McGlennon and Kinloch, ms sub) as this fishery is characterised by a general pattern of morning launches and afternoon retrievals (Kinloch *et al.*, ms sub).

Within each Route and season, the travelling portion of the circuit was divided into 10 minute intervals (including the point of arrival and departure from each access site). The divisions were numbered sequentially around the circuit and the initial starting location was chosen randomly from these divisions. Starting locations for

subsequent sampling days were then chosen systematically such that all access sites were visited at all times during the shift. For example, consider a simplified circuit in which there are 4 divisions and which is to be sampled 8 times within a stratum. If division 1 is chosen randomly for the first sampling day, then sampling on the following days would start at divisions 3, 2, 4, 1, 3, 2, 4.

This process of selecting starting locations differs from that proposed by Pollock *et al*. (1994) in three ways. i) It simplifies the division of the travel circuit by using ten minute intervals instead of one minute. ii) It excludes the period during wait times at access sites (except the start and finish) as potential starting locations. Inclusion of divisions during this period means that a circuit may start during the wait time and require the survey agents to return to the access site at the end of the shift to complete that wait time. Given the extended travel times between some sites in the survey, this potential sampling routine was considered to be unnecessarily onerous. iii) The third difference was systematic selection of starting locations after random selection of the initial location. This ensured that all sites were sampled at different times of the day within each season even where few days were sampled. The use of systematic selections would affect the variance formula used should within-day variances be calculated (Cochran 1977). However, in this survey (as in most recreational fishery surveys), only between-day variances were considered.

Within each spatio-temporal stratum (Route and season), the following survey design parameters were chosen: fishing day length, creel survey agent's shift time, total circuit time and waiting times at individual access sites. Extensive simulation trials were undertaken on the effect that varying these parameters has on the accuracy and precision of final estimates of fishing effort (Kinloch *et al.*, ms sub). The general conclusions drawn were that the fishing day length (ie the temporal sampling frame within a 24 hour period) should include the period covering most fishing activity. When periods of low fishing activity (e.g. early in the morning or late evening/night) were included, accuracy was adversely affected. The fishing day length was therefore chosen to suit the regional pattern of fishing effort for each season and varied between 9 and 16 hours (Table 3). In some cases, the day length was extended into the low fishing effort night-time period in an effort to obtain interviews from anglers fishing for snapper (*Pagrus auratus*) who were returning to the ramp after dark (e.g. Gulf St Vincent - January, Spencer Gulf NW - Nov to Jan).

The creel survey agent's shift time varied in relation to the fishing day length and ranged from 6 to 9 hours (Table 3). In general, the shift length was maintained at 7 - 8 hours in order to maximise the total waiting time available at access sites. As shift length was generally more than half the fishing day length, morning and afternoon shifts usually overlapped. Shift times were varied between Routes within each season in Spencer Gulf (due to regional heterogeneity of fishing activity) but were standardised in the remaining Routes (within each season). Circuit times were made equal to the shift length to ensure that all sites were visited each sampling day and to maximise the precision of the fishing effort estimate (Jones and Robson, 1991).

The final parameter to set was the wait times at each access site. Wait times can be allocated equally between sites or proportionally according to some variable (e.g. fishing effort) (Robson and Jones 1989). In this study, wait times were allocated proportionally to estimated fishing effort with a minimum time of 20 minutes for any one site (Table 1). While proportional allocation is likely to increase the variance of the effort estimate (Kinloch *et al.*, ms sub), it offers the potential to greatly increase the number of completed trip interviews necessary for catch rate and other information.

3. DATA COLLECTION

On each sampling day, the creel survey agent(s) travelled the rostered Route according to a pre-determined schedule. At each access site, the number of boat trailers was recorded at the beginning of the wait time. During the wait time, records were kept of all vessels launching or retrieving at the site. The time of launch/retrieval, number of persons onboard and type of boating trip (ie recreational fishing, commercial fishing or non-fishing) were recorded (see Appendix 1 for data entry sheet). Commercial fishing vessels were readily identifiable from

their distinctive boat registration numbers. Non-fishing recreational vessels were identified by interview (for retrievals) or assessment of the vessel and/or gear visible (for launches).

In addition to boating activity, observations on the prevailing weather conditions were recorded (see Appendix 2).

During the wait times, interviews were conducted with all recreational anglers returning to shore. Interviews were generally conducted with the person in charge of the vessel and responses were recorded at the time of the interview. The following information was collected (see Appendix 3):

- estimated launch time
- retrieval time (recorded by survey team)
- number of anglers onboard
- number of years fishing experience in the area by the most experienced angler
- average number of trips per year in the area for that angler
- postcode of boat owner
- presence/absence and type of echosounder (paper, LCD, colour)
- presence/absence of GPS
- location of fishing during that trip
    - based on commercial fishery MSF Blocks (Figs 2, 3 and 4)
    - additional codes used when fishing on official artificial reefs
- time fishing in each Block (where more than one)
- gear type(s) used
- number of each gear type
- time each gear type used for
- species targeted with each gear type
- species (and number) caught with each gear type
- species (and number) caught and released with each gear type
- reason for returning fish (e.g. undersize, not wanted, berried female crabs, etc)

The interviewee was then requested to allow the survey agent to count and measure their catch. After this process, each species record in the interview was noted as not seen, seen, counted and/or measured.

4. CALCULATIONS AND ANALYSIS

a) Seasonal fishing effort

In a bus-route survey, an unbiased estimate of the duration of a fishing party's trip can be calculated by

$$E_{ij} = (T/w_i) * x_{ij} \qquad \text{(Jones and Robson, 1989)} \qquad (1)$$

where
- E_{ij} = estimated fishing trip duration
- T = total circuit time
- w_i = waiting time at *i*th access site
- x_{ij} = recorded time of *j*th boat trailer at *i*th site

It follows then that the sum of each observed party's estimated trip duration will yield an unbiased estimate of fishing effort for the Route during the sampling period. In the development described by Robson and Jones (1989), each shift (ie morning or afternoon) was chosen with equal probability and the shifts were non-overlapping. To extrapolate the observed fishing effort to daily effort, the estimate was multiplied by $1/\alpha$, where

α is the probability that the time when the observation was made will be sampled. In their case, the probability was 0.5 that any period within the sampling frame would be sampled on a given day. In our case, the probability was 1 during the overlap period (which was sampled during both morning and afternoon shifts) but varied before and after the overlap period according to the number of morning and afternoon shifts selected in each stratum. These probabilities were therefore calculated separately for each season and Route.

Daily fishing effort (*DE*) was estimated for each sampling day and mean daily fishing effort (MDE_h) calculated within each seasonal stratum for each Route. Total fishing effort for the seasonal stratum (SE_h) was calculated by

$$SE_h = N_h * MDE_h \quad (2)$$

where N_h = number of days in the *h*th seasonal stratum.

The bus-route estimator is not normally distributed when considered for individual sampling days (Jones *et al*. 1990; Kinloch *et al.*, ms sub). The former study showed empirically that use of the t-distribution resulted in slightly skewed α values with increased probability of inclusion in the lower tail and decreased probability in the upper tail. However, it was shown that normality increases when routes are combined for the estimate of total fishing effort for the study area (Jones *et al*. 1990). Further, the distribution of mean daily fishing effort, calculated from each sampling day within a stratum, also approached normality (Kinloch *et al.*, ms sub). It was considered, therefore, that mis-specification of variances of mean daily fishing effort and confidence intervals using the t-distribution would be minor.

The variance of mean daily fishing effort ($V(MDE)_h$) was calculated by

$$V(MDE)_h = \frac{s_h^2}{n_h}\left(\frac{N_h - n_h}{N_h}\right) \quad \text{Pollock } et\ al. \text{ (1994)} \quad (3)$$

where s_h^2 = sample variance within *h*th seasonal stratum
N_h = number of days in the *h*th stratum
n_h = number of days sampled within the *h*th stratum

and its standard error by $\sqrt{V(MDE)_h}$. The finite population correction was routinely used as most strata were sampled at frequencies greater than 0.1 (Table 2). The variance of total seasonal effort ($V(SE)_h$) was calculated by

$$V(SE)_h = N_h^2 * V(MDE)_h \quad (4)$$

These effort estimates included a component of non-recreational fishing effort as all trailers observed at a site were recorded. In most cases in this fishery, the trailers of recreational fishing vessels can not be distinguished from other trailers and it was not possible therefore to eliminate non-recreational fishing trailers at the time of data collection. To reduce the total fishing effort estimate by the non-recreational fishing component, the proportion of recreational fishing vessels observed during all launches and retrievals was calculated. Recreational fishing effort (*RE*) was then calculated by

$$RE = R_h * Se_h \quad (5)$$

where R_h = proportion of all vessels observed launching and retrieving in the *h*th season which were recreational fishing vessels

and its variance (*V(RE)*) by

$$V(RE) = R_h^2 * V(Se_h) \quad (6)$$

The co-efficient of variation (CV) of seasonal and annual effort estimates was calculated by

$$CV = \left(SE \,/\, estimate\right) * 100 \tag{7}$$

For comparison with commercial fishery effort, the recreational effort estimates were converted from boathours to boatdays by dividing by the average duration of each trip (taken from interview data). Trip duration data were first analysed to assess whether they varied between seasons and/or between Routes, or whether an overall average trip duration could be used in the calculations.

The data for Gulf St Vincent, Spencer Gulf and West Coast were analysed separately by conducting a generalised linear model using JMP statistical software (SAS Institute Inc) after preliminary analysis of variance heterogeneity by Cochran's C test.

b) Seasonal harvest per unit effort (SHPUE)

The terms harvest and catch have been used interchangeably and confusingly in the past. Harvest refers to the fish that were caught and retained, whereas catch refers to all fish caught (whether returned to the water or retained) (Malvestuto 1983). In this report, only those fish retained are considered and the term harvest is therefore used.

HPUE was calculated for nine main species (as well as all species combined) by the total ratio method for each season within each Route. The data for calculating HPUE were obtained from interviews with anglers returning to the access sites during the creel survey agent's wait time at the site. For each species

$$HPUE_h = \left(\sum_{j=1}^{n}\sum_{i=1}^{m} H_{ij}\right) \Big/ \left(\sum_{j=1}^{n}\sum_{i=1}^{m} E_{ij}\right) \tag{8}$$

where $HPUE_h$ = harvest ratio in the hth season
H_{ij} = harvest of the ith vessel on the jth sampling day
E_{ij} = fishing effort of the ith vessel on the jth sampling day

The total ratio estimator was used as it shows greater precision than alternate harvest rate estimators (Crone and Malvestuto 1991) and is recommended for access site surveys in preference to the mean of individual party harvest rates (Jones *et al*. 1995). The distribution of total ratio estimates are much less skewed (ie show fewer zero values) than those obtained from individual fishing party values (Crone and Malvestuto 1991).

The variance of the harvest rate ($V(HPUE)_h$) estimate in the hth season was calculated by

$$V(HPUE)_h = \left(1 \Big/ \left[\overline{E}^2 (n-1)\right]\right) \sum_{j=1}^{n} \left[H_j - HPUE_h\left(E_j\right)\right]^2$$

(Crone and Malvestuto 1991) (9)

where $\overline{E}$ = mean daily fishing effort from interviews over n sampling days
H_j = daily total of harvest based on all interviews during the jth day

E_j = daily total of effort based on all interviews during the *j*th day

c) Seasonal harvest

The seasonal harvest (SH_h) in numbers for each species was calculated for each Route by

$$SH_h = SE_h * HPUE_h \quad (10)$$

and its variance $V(SH)_h$ by

$$V(SH)_h = (SH)_h^2 \left(\frac{V(SE)_h}{SE_h^2} + \frac{V(HPUE)_h}{HPUE_h^2} + \frac{2\,\mathrm{cov}(DE, HPUE)}{(SE_h * HPUE_h)} \right)$$

Caputi (1976) (11)

where cov (*DE*,*HPUE*) = sample covariance of daily estimates of effort and HPUE

Numbers of fish were converted to weight by use of length frequency distributions derived from fish measured during the interview process. The weight of each length class (in centimetre groups) was estimated by use of published or derived length-weight relationships (Table 4). The sample numbers measured in each length class were raised to the numbers in the total harvest by multiplying by the ratio of number of estimated fish in harvest/number of fish measured. The predicted weight of each length class was then multiplied by the estimated numbers in each length class and summed for the harvest in weight. These calculations were carried out for each MSF Block for the annual harvest estimates only.

Standard errors were not calculated for tonnages but their magnitude could be estimated from the magnitude of the standard errors associated with the harvest in numbers (West and Gordon 1994).

d) Annual estimates per Route

Following calculation of the six seasonal estimates of fishing effort, HPUE and harvest within each Route, the values were aggregated into annual estimates for each Route. Annual values for fishing effort (*AE*) were calculated by

$$AE = SE_1 + SE_2 + ... SE_6 \quad (12)$$

and its variance (*V(AE)*) by

$$V(AE) = V(SE)_1 + V(SE)_2 + ...V(SE)_6 \quad (13)$$

The annual harvest (*AH*) and its variance (*V*(*AH*)) were calculated by the same formulae.

The annual HPUE (*AHPUE)* for each species was calculated by

$$AHPUE = \sum_{h=1}^{6} \frac{N_h * HPUE_h}{N} \quad (14)$$

where N_h = number of days in the *h*th season
N = number of days in study period (=365)

and its variance (*V(AHPUE)*) by

$$V(AHPUE) = \sum_{h=1}^{6} \frac{W^2 * V(HPUE)_h}{n_h} - \sum_{h=1}^{6} \frac{W_h * V(HPUE)_h}{N}$$

Cochran (1977) (15)

where W_h = stratum weight (N_h/N)
n_h = number of days sampled in hth season

e) Spatially aggregated fishing effort and harvests

Following estimation of the annual fishing effort and species specific harvests for each Route, aggregated totals and their variances were calculated for Gulf St Vincent, Spencer Gulf and the West Coast, as well as all areas combined. These calculations were made in an analogous process to that used for aggregating seasons within a Route.

Although the 2 regions were sampled in different 12 month periods, State totals have been calculated by summing the regional totals. It is acknowledged that inter-annual variability is ignored in this method of calculation.

f) Conversion of Route effort and harvest estimates into MSF Block estimates

For comparison of recreational and commercial fishing effort and harvests, the spatial scale of the recreational data was manipulated into areas corresponding to the Marine Scalefish Fishery (MSF) Blocks (Figs. 2, 3 and 4). The Routes used in the bus-route sampling design were aligned as much as practicable with MSF Blocks but in most cases included more than one Block. Additionally, fishing effort from more than one Route was often expended in the same MSF Block. However, interviewees were asked which MSF Block they had been fishing in (with the assistance of a map if needed) and responses could therefore be allocated to individual Blocks.

The annual Route fishing effort estimates were apportioned to Blocks by the following process:

Within each season and Route

- the amount of fishing effort expended in each MSF Block by interviewed anglers was calculated as a proportion of all recreational fishing effort recorded
- the total recreational fishing effort estimate for that stratum was then allocated to MSF Blocks according to these proportions

For each MSF Block

- the apportioned effort from each Route was summed

A similar process was used to apportion species specific harvests from sampling Routes to MSF Blocks. In this case, estimates of harvest were apportioned according to the relative proportion of harvest of that species recorded in each MSF Block.

g) Commercial fishery catch and effort

Commercial fishers within the Marine Scalefish Fishery are obligated to submit monthly catch and effort data under the regulations of the Fisheries Act 1982. For comparison with recreational fishery estimates of effort and harvest, the commercial data were collated for the corresponding periods of this study within MSF Blocks. It should be repeated that the periods of this study (April to March) do not correspond with the traditional publication period of July to June and figures will therefore vary from other published sources.

For reasons of confidentiality, commercial data were aggregated where <5 fishers contributed to the catch or where 1 or 2 fishers contributed a high proportion of the catch for an MSF Block.

h) Targeted fishing effort

Recreational angler interviewees were asked to nominate species which they were targeting for each gear type used. Targeted fishing effort was calculated for each species within each MSF Block as the relative proportion of fishing effort recorded in all interviews for that Block. To simplify the analysis, some Blocks were pooled where their results were similar.

Commercial fishers also submit target species for each of their fishing activities. The relative proportion of commercial fishing effort targeted on each species could therefore also be calculated. The commercial fishery was divided into two categories - line and net. Within the line category, gear types used included handlines, longlines, drop lines, trotlines and jigs. The net fishery includes haul, gill, dab, bait and shark nets, purse seines, crab nets, pots and traps and fish traps.

In both sectors, a category existed for un-allocated fishing effort which has been coded as "ANY".

i) Kangaroo Island data

Kangaroo Island was not sampled systematically due to resource limitations. In total, 12 days were sampled between July 1994 and February 1995. Sampling trips were generally consecutive days and, as such, sampling cannot be considered as independent or random.

To provide some broad results, the data were pooled into two seasons - July to October (5 sampling days), and November to February (7). Fishing effort was estimated using the same calculations as has previously been described. Similarly, HPUE and harvest were calculated (for King George whiting only) for the same pooled seasons. Errors associated with estimates were not calculated due to the limited sampling carried out and the lack of independence of data collected.

DETAILED RESULTS

OVERVIEW

1) To quantify, spatially and temporally, recreational catch and effort for species of common interest to the recreational and commercial sectors.

The catch and effort of the recreational boat fishery has been quantified in all coastal waters from Victor Harbour to Ceduna. The relative harvest of commercial and recreational fishers have been compared at spatial scales ranging from 60 nm^2 to whole of Gulf and Statewide.

2) To use the information gained in 1) to provide information to assist in the resolution of conflicts and facilitate the implementation of equitable and rational management strategies.

The results reported from this study form the basis for an understanding of current resource sharing arrangements. Conflicts relating to this arrangement can now be equitably dealt with based on quantified information rather than assertions. The implementation of management arrangements which would alter this de-facto resource allocation require additional inputs (notably economic and social). Some of these data form the objectives of concurrent work (economic) while some remain unstudied (social).

The results of this study have already been used to form the basis of more equitable cost-recovery arrangements within the fishery.

3) To disseminate the technical requirements for undertaking large-scale surveys using the bus-route methodology to other Australian researchers.

A Workshop was conducted at Cronulla, NSW, in July 1995 to disseminate the methodological basis for undertaking bus-route surveys. Participants from all State and Territory fisheries agencies were present, as were several university students.

It is noteworthy that bus-route surveys are now being conducted by some of these participants in Western Australia, Victoria, New South Wales and Queensland.

1. FISHING EFFORT

The proportion of recreational fishing effort in each Route (compared to total boating effort estimates) is shown in Table 5 and range from 0.25 to 0.951 (Table 5). These data were used to adjust total boating effort estimates obtained from the bus-route sampling calculations.

Seasonal and annual recreational fishing effort for each Route are shown in Table 6. In Gulf St Vincent, just over 500,000 boathours were estimated for the twelve month period (Table 6a). Approximately 60% of this was expended from the metropolitan Adelaide coast, 17% from south-eastern Gulf waters adjacent to Fleurieu Peninsula and the remainder from Yorke Peninsula. It should be noted that O'Sullivan's Beach ramp contributed most of the effort to the SE Gulf Route and, in light of its proximity to south coast suburbs, should be considered a metropolitan ramp. As was expected, most of the effort was expended in the summer and autumn seasons with daily effort highest from January through to March (Fig. 5).

Spencer Gulf fishing effort was approximately 80% of the level of Gulf St Vincent and was estimated at about 415,000 boathours, with about 30% of that effort being expended in the CE Route from Port Hughes to Port Broughton (Table 6b). All other Routes, with the exception of CW, yielded between 13% and 19% of the Spencer Gulf effort. Seasonal patterns were similar to those in Gulf St Vincent with the highest daily effort expended in the summer holiday period between December 26th and January 31st (Fig. 5).

Recreational fishing effort in West Coast waters was approximately 11-13% of the effort in either Gulf and was estimated at just over 56,000 boathours (Table 6c). Approximately 61% of the effort occurred in the northern Route between Streaky Bay and Ceduna (Northern). Seasonal patterns were also similar to the two Gulfs with the highest daily effort occurring between January and March (Fig. 5).

Overall fishing effort for the study period was estimated at almost 1 million boathours (Table 6c).

The precision of fishing effort estimates for each Route was between 10 and 20% and therefore achieved the objective of the sampling design (McGlennon and Kinloch, ms sub). Estimates for spatially aggregated regions

(ie. each Gulf and West Coast) had precision of better than 10% while the level of precision for the State estimate was 5.0%.

For comparison with commercial fishery data, estimates of fishing effort in boathours were converted to days by division of boathours by average trip duration. Individual trip duration data were homoscedastic between Routes and seasons for Gulf St Vincent and West Coast (Cochran's C = 0.31 and 0.57 respectively) and untransformed data were therefore analysed. Spencer Gulf data were heteroscedastic (C = 0.26) and were transformed (ln) before analysis. For Gulf St Vincent and West Coast, trip duration was not significantly different for season ($P > 0.05$) but was for Route ($P < 0.001$ and $= 0.002$ respectively). The interaction term of season*Route was not significant.

For Spencer Gulf, the interaction term was significant ($P < 0.05$) thereby confounding analysis of the main factors (Underwood 1981), which again yielded a (nominally) significant result for Route ($P < 0.001$) but not for season. For simplicity, average trip durations for each Route (pooled across seasons) were used for all of the study area (Table 7).

After conversion from boathours to boatdays, recreational effort was then manipulated into spatial areas corresponding to MSF Blocks for direct comparison with the commercial fishery (Table 8). The total number of boatdays expended in the commercial marine scalefish fishery for the period corresponding to the recreational survey were 17,002 for Gulf St Vincent, 22,813 for Spencer Gulf and 12,901 for the West Coast, making a total of 52,716 days (Tables 8a,b,c). By comparison, recreational fishing effort was estimated at 99,787, 72,797 and 24,316 boatdays for the three areas respectively for a total of 196,900 boat days. These data equate to a ratio of recreational fishing effort to commercial fishing effort of 5.87, 3.19 and 1.88 respectively and an overall ratio of 3.74.

It should be noted that the ratio of recreational to commercial fishing effort varies markedly between Blocks within the larger spatial areas (Table 8).

Kangaroo Island

Recreational fishing effort was estimated at 34,687 boathours (8,629 boatdays) for the period between July and February. This period (July to Feb) was shown to yield an average of 63.7% of total effort in adjacent Blocks in Gulf St Vincent. The estimate was therefore raised by a factor of 1.57 to derive an annual estimate of 54,458 boathours (13,547 boatdays). The majority (68%) of this effort was expended in Block 42 (37,464 boathours) with the remainder expended in Block 41 (Fig. 2).

2. TARGETED FISHING EFFORT

The target species for each MSF Block for both the commercial and recreational fisheries can be seen in Table 9. The recreational fishery showed a strong preference for targeting King George whiting (KGW), which rated the highest target in every Block(s). The percentage of fishing effort targeted for this species ranged from 22.6 to 68.33%. Other highly targeted species were calamary (1.3 to 18.0%), southern sea garfish (3.1 to 23.9%), blue swimmer crabs (3.3 to 15.9%), snapper (1.45 to 20.6%) and Australian herring (1.3 to 13.1%). A number of other species were consistently sought after by a small percentage of anglers e.g. Australian salmon, snook, flathead and blue mackerel. Additionally, some species with limited distributions were only targeted by anglers in those areas e.g. sweep, yellowtail kingfish, wrasses, sand crabs and southern bluefin tuna.

The commercial line fishery also heavily targeted King George whiting, rating the highest target species in 9 of the 13 Blocks and attracting up to 95.55% of the commercial line effort (Table 9). In the remaining four areas, snapper (to 70.2%) and calamary (to 76.1%) were each rated most targeted species in 2 areas. Of the remaining species, only shark, snook and mulloway were targeted by more than 10% of the fishing effort in any one Block(s).

Analysis of commercial netting effort was limited in some areas due to the high proportion of time that was not allocated to a specific species. This percentage was commonly 15-30% but reached 79.3% in one area (Table 9). It is known that some fishers record "ANY" for confidentiality reasons while others target different species for each net shot on a given day. The latter group use "ANY" to group the different target species. For the effort for which species were recorded, spatial differences were apparent. In central and northern Gulf St Vincent, blue swimmer crabs and garfish were highly targeted, with lesser effort expended on King George whiting, yellow-eye mullet and calamary. The remaining areas of this Gulf yielded a mixture of targeted effort on shark, garfish, King George whiting, yellow-eye mullet, salmon and mulloway.

In northern Spencer Gulf, most commercial netting effort was expended on garfish, King George whiting and blue swimmer crabs. An increase in shark netting in southern Gulf waters replaced crab netting.

In the northern West Coast waters, commercial netting is largely targeted on shark, blue swimmer crabs and garfish. King George whiting is also highly targeted in the central region and Coffin Bay with sand crabs highly targeted in the latter area as well.

The regional aggregations of targeted effort for the three sectors are shown in Fig. 5. In all areas, potential resource conflicts exist with King George whiting (recreational and commercial line) and garfish (recreational and commercial net). In Gulf waters, further conflicts are likely with calamary (recreational and commercial line) and blue swimmer crabs (recreational and commercial net), while snapper is also likely to be the source of conflict in Spencer Gulf and to a lesser extent in Gulf St Vincent.

3. HARVEST

a. Species composition

The recreational fishery survey recorded a total of 68 taxa being caught and retained (Tables 10 and 11). The number of species harvested was in excess of 80 as several of the taxa included more than one species (e.g. leatherjackets (at least 6 species) and flathead (4 sp)).

King George whiting (*Sillaginodes punctata*) was the most commonly caught species, accounting for more than a quarter of the total harvest of 65,135 fish (Table 10). It was followed by garfish (*Hyporhamphus melanochir*), blue swimmer crabs (*Portunus pelagicus*) and Australian herring (*Arripis georgiana*). These four species made up approximately 75% of the total recreational harvest by number. Some regional differences were evident for these species with garfish being the most commonly caught species in Gulf St Vincent and blue swimmer crabs ranking lowly on the West Coast (where it's distribution is limited).

Several shellfish taxa have been collated separately as their numbers were often only estimated from the size of their holding containers (Table 11). It is also likely that some interviewees failed to mention catches of their baitfish collections when responding to questions relating to harvest. However, it is clear that considerably quantities of some of these taxa are collected for bait (and/or food).

b. Individual species

In the following discussions, the seasonal pattern of daily harvests rates is used. It should be noted that daily harvest rates reflect both the average fishing effort during the stratum and HPUE. Standard errors have not been shown on the seasonal harvest rate graphs but can be calculated by dividing the standard errors shown in harvest Tables by the number of days in the seasonal stratum (Table 2).

The conversion of numbers of fish to tonnes in the recreational fishery used the size distribution of fish measured during the interview process. The length frequency results are not presented in this report but will be published elsewhere.

i) King George whiting

The seasonal harvest rates (average daily harvest rate) are shown in Fig. 7 and some common features can be seen between Routes. Lowest daily harvest rates were generally exhibited between September and December. Most Routes then showed an increase during the summer holiday period of late December-January with some showing a clear peak at this time (e.g. northern West Coast, NW Gulf St Vincent). Other peaks occurred in February-March (e.g. SE Spencer Gulf), April-May (several Routes) and June-August (SW Gulf St Vincent, CE Spencer Gulf).

Peak daily harvest rates ranged from 900-950 fish per day (SW Spencer Gulf, northern West Coast and metropolitan Adelaide), 650-750 (NE, CE and SE Spencer Gulf) and 4-500 (NW Gulf St Vincent and Spencer Gulf).

The estimated harvest of King George whiting for all areas combined was 1,154,662 (SE = 151,041) fish (Table 12). Of this total, 53% was caught in Spencer Gulf, 35.8% in Gulf St Vincent and 11.2% in West Coast waters. For individual Routes, metropolitan Adelaide yielded the highest proportion of the harvest (19.0%) followed by central-eastern Spencer Gulf (14.6%), south-western Spencer Gulf/Coffin Bay (11.4%) and south-eastern Spencer Gulf (9.2%). Despite relatively low fishing effort, the northern waters of the West Coast also yielded a relatively large share of the harvest (8.0%).

The precision of harvest estimates within each Route was generally between 30% and 45% (Table 12). However, estimates for the three larger regions (aggregated Routes) were between 16.5% and 26.5% which was near the target level of 20%. The precision level of the State estimate was 13.1%.

The comparison of commercial and recreational harvests in tonnes of King George whiting is shown in Table 13. The Statewide harvest estimate for the recreational fishery was 269.9 tonnes compared to 513.7 tonnes for the commercial fishery in the same period. This represents a 34.4% share of the total harvest that was caught by the recreational sector. The relative harvest varied considerably across the State from approximately equal share in Gulf St Vincent to 37.4% recreational in Spencer Gulf and 19.4% in West Coast waters. Further variability is demonstrated within the major regions (Table 13).

Kangaroo Island

It should be repeated that Kangaroo Island estimates are based on limited sampling and should be used cautiously. Extrapolation of the harvest during the sampling period to an annual estimate assumed that HPUE was similar in the sampling and non-sampling period.

14 interviews were recorded from fishing activity in Block 41 and 36 interviews from Block 42. The total King George whiting harvest was estimated at 34.7 tonnes with the majority harvested in Block 42 (26.2 tonnes; 75.5%) and the remainder in Block 41 (8.5 t; 24.5%). This compared with the commercial catch over the same period of 48.8 tonnes (14.9 t in Block 41 and 33.9 t in Block 42).

ii) Southern sea garfish

Harvest rates for garfish were strongly seasonal with the peaks for most areas occurring during the January holiday period (Fig. 8). Harvest rate peaks during this period varied from 4-600 fish per day in three Gulf St Vincent Routes, 1000-1400 per day in SE and CE Spencer Gulf to a peak of 3500 per day in metropolitan

Adelaide. The remaining Routes showed peaks of less than 200 garfish per day. Exceptions to the January peak occurred in NW Gulf St Vincent (Feb-Mar), SW Gulf St Vincent (January and Apr-May) and northern West Coast (Apr-May).

The estimated State harvest of garfish (in numbers) was 742,386 of which 65% was taken in Gulf St Vincent, 32.8% in Spencer Gulf and 2.2% in West Coast waters (Table 14). Over 40% of the State's recreational harvest was taken off metropolitan Adelaide. Other Routes yielding significant harvests were CE and SE Spencer Gulf (15.6% and 10.4%) and the remaining three in Gulf St Vincent (7.1 to 9.2%).

The levels of precision of Route harvest estimates were lower than those for King George whiting and varied from 38.3% to 314%, although the range for Routes where significant harvests were taken was 38.3% to 55.9%. The precision levels for Gulf estimates were 26% and 34% and was 20.4% for the State estimate.

The recreational harvest of garfish (in tonnes) was estimated at 64.1 tonnes compared to the commercial harvest during the same period of 425.6 tonnes (Table 15). This represents a 13.1% recreational share of the total harvest. The recreational share in Gulf St Vincent, Spencer Gulf and the West Coast was 19.6%, 7.8% and 8.9% respectively. The highest commercial harvests occur in the northern Blocks of the two Gulfs where the species is netted in shallow waters over seagrass beds. Recreational fishing effort was generally lower in these areas and the relative share of garfish harvest was therefore heavily weighted towards the commercial sector. The recreational share tended to increase towards the south of the Gulfs as effort increased and commercial netting effort decreased. An exception to this is Block 44 in Gulf St Vincent where significant commercial dab netting occurs. The recreational share only exceeded 50% in the two Blocks adjacent to metropolitan Adelaide.

iii) Southern calamary

The seasonality of calamary harvest rates is similar to garfish with a strong summer peak for most Routes (Fig. 9). The highest harvest rates were recorded in Metro Adelaide (468 calamary per day), SE Gulf St Vincent (272) and CE and SE Spencer Gulf (200-250). An exception to the trend was NW Gulf St Vincent which recorded its peak harvest rate of 152 per day in April-May. The harvest rates for several of the Routes were relatively low (< 50 per day) and showed little fluctuation throughout the year.

The total recreational harvest (in numbers) was estimated at 224,059 calamary, with approximately equal numbers caught in each Gulf and about 5% of the total caught in West Coast waters (Table 16). Within the Gulfs, Routes on the eastern coasts generally recorded the greatest harvests. Metropolitan Adelaide (22.9%), SE and CE Spencer Gulf (17.3% and 14.9%) and SE Gulf St Vincent (11.6%) recorded significant catches.

The precision of Route estimates with significant calamary harvests ranged from 39.9% to 47.8% but extended to 90.4% on low harvest Routes (Table 16). Precision of the Gulf estimates were 27.7% and 23.8% but was higher for the West Coast (60.6%). The State total was estimated to a precision level of 17.6%.

The recreational harvest (in tonnes) of calamary was estimated at 82.8 tonnes compared to a commercial harvest of 353.6 tonnes for the same period (Table 17). This equates to a 19.0% recreational share of the total harvest. The recreational share was very similar in the three main regions, varying from 16.2 to 19.6%. In general, the share within MSF Blocks was consistently between 8.5 and 20% with the main exceptions being the metropolitan Adelaide Blocks 36 and 43 (36.6%) and south eastern Spencer Gulf Block 33 (39.9%).

iv) Blue swimmer crab

The distribution of blue swimmer crabs is limited to the northern regions of the two Gulfs and the northern section of the West Coast study area. Accordingly, harvests were recorded from only 8 of the 12 Routes surveyed, and very few crabs were caught in two of these. This discussion is therefore limited to the remaining 6 Routes.

Daily harvest rates were strongly seasonal, with the highest rates shown in February-March for all Routes except northern West Coast, which peaked in the December25-January season (Fig. 10). Rates varied from about 120 crabs per day in West Coast waters, between 3-700 crabs per day for Spencer Gulf and NW Gulf St Vincent to a peak of just over 3,500 per day in metropolitan Adelaide. Harvest rates outside of the peak seasons between December and March were generally very low.

The total State recreational harvest for blue swimmer crabs was estimated at 590,434 (Table 18). A high proportion (71.8%) of these were caught in Gulf St Vincent followed by Spencer Gulf (27.3%) and the West Coast (0.9%). Of the total harvest, 63.0% was caught in the metropolitan Adelaide Route with the other major contributing Routes being NE, NW and CE Spencer Gulf (11.1%, 10.6% and 5.7%) and NW Gulf St Vincent (8.7%).

Levels of precision varied between 34.1% and 78.2% for Routes with relatively high harvests (Table 18). Gulf estimates had precision levels of 43.6% and 26.2% while it was 32.1% for the State estimate.

The recreational harvest was estimated at 161.2 tonnes, compared to the commercial catch during the same period of 609.9 tonnes (Table 19). This equates to a recreational share of the total harvest of 20.9%. The share was about 30% in Gulf St Vincent and the West Coast and around 10% in Spencer Gulf. Considerable variation in the recreational share was evident within these broader regions.

v) Australian herring / tommy ruff

As with several other species, the seasonal harvest rates of Australian herring generally peaked in summer, with the highest rates recorded in the Dec 25-January season for all Routes except for NW and NE Spencer Gulf and SW Gulf St Vincent (April-May) (Fig. 11). The peak rates were generally higher in Gulf St Vincent (240-460 per day and 1490 per day in METRO). Spencer Gulf and West Coast peaks were only 20-180 fish per day except for SW (350) and CE (700). Harvest rates during the period June to December were generally very low.

The harvest of Australian herring (in numbers) was estimated at 378,615 fish of which 59.4% were caught in Gulf St Vincent, 32.8% in Spencer Gulf and 7.8% in West Coast waters (Table 20). The metropolitan Adelaide Route contributed 26.8% of the harvest, with SW (13.7%) and NW (12.6%) Gulf St Vincent and CE Spencer Gulf (11.4%) each contributing more than 10% of the total harvest.

The Route harvests were estimated with precision levels between 39% and 76% while aggregated estimates ranged from 26.2% to 32.8%. The State harvest estimate precision level was 19.1%.

After conversion to weight, the recreational harvest was estimated at 35.6 tonnes compared to the commercial catch of 237.6 tonnes for the same period (Table 21). This represents a recreational share of the total harvest of 13.0%. The recreational share was highest in West Coast waters (where overall catches were relatively low), about 20% in Gulf St Vincent and low (6.2%) in Spencer Gulf. While the recreational harvest was consistently low in Spencer Gulf Blocks, some spatial variability is evident in the other regions.

vi) Snook

The harvest rates of snook were generally lower than for species discussed previously (Fig. 12). Trends in harvest rates were also less consistent, with peaks occurring in April-May (SW Gulf St Vincent, SE Spencer Gulf and Northern West Coast), Sept-Oct (SE Gulf St Vincent and CE Spencer Gulf), Nov-Dec (NW Spencer Gulf), Dec-Jan (CW Spencer Gulf and metropolitan Adelaide) and Feb-Mar (NW Gulf St Vincent and SW Spencer Gulf).

The recreational harvest of snook was estimate at 81,643, with 57.5% caught in Spencer Gulf, 33.6% in Gulf St Vincent and 8.9% in West Coast waters (Table 22). The highest proportion of the harvest was caught in CE (18.4%) and SE (15.8%) Spencer Gulf with several other Routes contributing between 7.5% and 12.3% each.

As the total harvest of individual species decreased, the precision levels of their harvest estimates were reduced. The Route harvests of snook were estimated with precision levels which generally exceeded 70% (Table 22). Aggregated Route estimates produced precision levels of between 42.2% and 76.8% while the precision of the State estimate was 33.8%.

The recreational harvest of snook was estimated at 49.8 tonnes, compared to a commercial catch of 143.8 tonnes (Table 23). This represents a recreational share of the total snook harvest of 25.7%. The recreational share was 22-28.5% in all regions, although it varied significantly in the Blocks within each region. The recreational share tended to be lowest in the northern Blocks of the Gulfs but increased in the southern Blocks.

vii) Australian salmon

Harvest rates of Australian salmon were similar to those of snook, with many Routes yielding less than 20 salmon per day for the whole year (Fig. 12). The four Routes to exceed this level were SW Spencer Gulf, which peaked at about 60 fish per day in both Nov-Dec and Feb-Mar, Metropolitan Adelaide and NW Gulf St Vincent (45 and 65 fish per day in April-May) and SE Gulf St Vincent (over 100 fish per day in Sept-Oct).

The annual recreational harvest of Australian salmon was estimated at 45,333 (Table 24). Just over half were caught in Gulf St Vincent (54.7%) with 38.2% caught in Spencer Gulf and 7.1% in West Coast waters (Table 24). The highest yielding Route was SW Spencer Gulf (27.1% of the total harvest), followed by the three Gulf St Vincent Routes - SE (21.2%), NW (20.1%) and metropolitan Adelaide (13.4%). The harvests from the remaining Routes were relatively low.

The level of precision of Route estimates varies between 64.8% and 139.7% for Routes contributing significantly to the total harvest (Table 24). Precision levels for aggregated Routes ranged from 45.4% to 67.4%, and was 41.8% for the State total.

The recreational harvest was estimated at 16.9 tonnes compared to a commercial catch of 343.7 tonnes in the same areas during the same period (Table 25). It should be noted that Australian salmon is also taken commercially in areas outside of this study area and the figures presented here therefore under-state the total commercial catch. The recreational share within the total study area and within the aggregated regions is between 3.9% and 6.5%.

viii) Snapper

Seasonal harvest rates for snapper were generally higher in summer for most Routes with the highest peaks occurring in the Dec 25-Jan season (Fig. 14). The highest daily harvest rates occurred in CE Spencer Gulf (about 84 fish per day), and CW and NW Spencer Gulf (about 40) and the combined NW and Metro Gulf St Vincent Routes (about 30). Harvest rates in other Routes were generally below 10-20 fish per day.

The recreational harvest was estimated at 23,543 snapper (Table 26). The majority of these were caught in Spencer Gulf (86.9%), with 13.0% caught in Gulf St Vincent and less than 0.5% in Coffin Bay, West Coast. Only 2 snapper were recorded in West Coast recreational catches. The snapper harvest in Gulf St Vincent was evenly spread between the four Routes while CE (35.4%), CW (22.5%) and NW (19.6%) contributed most to the Spencer Gulf harvest. It should be noted that these data refer to numbers - the size of snapper caught in the different areas differed significantly.

The Route harvests were estimated with levels of precision between 81.1% and 151.4%, reflecting the low harvest rates and patchy information. Aggregated Route data had precision levels of 71.9% and 47.7% while it was 42.5% for the State total.

The recreational snapper harvest in tonnes was estimated at 48.0 tonnes compared to the commercial catch of 282.0 tonnes (Table 27). This equates to a recreational share of 14.5% of the total harvest, 26.9% in Gulf St Vincent and 12.8% in Spencer Gulf. The Coffin Bay snapper were not measured and so no weight can be estimated for that harvest. However, the snapper caught in Coffin Bay are generally large (10+ kg) and an arbitrary weight of 1 tonne has been allocated for the 100 estimated fish.

ix) Blue mackerel

Daily harvest rates were strongly seasonal with peak rates occurring from late December to March (Fig. 15). Harvest rates within Routes were only significant in SE and Metro Gulf St Vincent, with peaks of 250-300 fish per day. Rates within individual Routes in Spencer Gulf and West Coast were relatively low and were pooled for graphing. Peak rates were about 100 and 60 fish per day respectively for these areas.

The annual recreational harvest was estimated at 68,448 fish, with the majority being caught in Gulf St Vincent (78.2%) (Table 28). The SE and Metro Gulf St Vincent Routes contributed 76.6% of the total catch with the only other significant contributor being CE Spencer Gulf (9.8%). Blue mackerel were only recorded in the catch of West Coast anglers in Feb-Mar in the northern Route.

The precision levels of the three Routes contributing most of the catch ranged from 67.2% to 149.1% while aggregated Route harvests were estimated with precision levels of 51.0% to 197.0%. The State harvest was estimated with 44.1% precision.

The recreational harvest was estimated at 15.5 tonnes compared to a commercial catch of 5.2 tonnes (Table 29). This represents a recreational share of 74.9% of the total harvest made up of 70.3% share in Gulf St Vincent and nearly 100% in remaining waters.

x) All fish

This category includes all fish recorded in the harvest of recreational anglers with the exception of shellfish such as scallops, cockles, mussels, razorfish. Blue swimmer and sand crabs were included.

The seasonal patterns in daily harvest rates closely follow the patterns of effort (Fig. 5), with peaks in all areas in the January holiday season followed by a decline through to April-May and relatively stable but low harvests during June to December (Fig. 16). The peak daily harvest rate was recorded in metropolitan Adelaide where nearly 10,000 fish per day were caught. Peaks in other Gulf St Vincent Routes ranged from about 1,400 to 2,000 fish per day. In Spencer Gulf, the peak rate was recorded in the CE Route at about 3,500 fish per day with other Routes ranging from 700 to 2,000. The Central West Coast Route recorded the lowest peak at about 340 fish per day compared to nearly 1,500 in the Northern Route.

The total annual recreational harvest was estimated at 3,770,256 fish (Table 30). Of these, 52.9% were caught in Gulf St Vincent, 40.4% in Spencer Gulf and 6.7% in West Coast waters. Within the larger regions, the Metropolitan Adelaide Route caught nearly one third of the total harvest (32.2%) or about 1,200,000 fish. Other Routes contributing significant catches were CE Spencer Gulf (about 475,000 or 12.6%) and several from 200-300,000 or 5% (the remaining Gulf St Vincent Routes and SW, NE and SE Spencer Gulf).

The Route harvests were estimated with precision levels between 19.2% and 33.6% with aggregated Routes estimated with 10.1% to 15.4% precision. The State total harvest was estimated with 9.2% precision.

Because of the range of average weights for each species, it was not possible to determine a total recreational harvest in tonnes. It may be of some interest that the sum of the weight of the nine main species discussed previously was 743.8 tonnes, compared to a commercial landed weight of 2,915 tonnes.

DISCUSSION

The application of the bus-route creel survey method in this study has enabled the calculation of recreational harvests over large spatial scales - scales not previously surveyed within Australia. Harvests have been calculated for the key species of common interest to the recreational and commercial sectors as well as for the overall recreational harvest of all fish. Quantification of these harvests has allowed a time- and space-specific comparison to be made between the two fishery sectors.

It is clear that recreational fishing effort is significant, with approximately 1 million boathours expended in a 12 month period. In many (but not all) cases, recreational harvests are similar to the seasonal pattern of fishing effort and could therefore be expected to follow overall inter-annual trends in effort. However, little information is available to test this assumption. No systematic data collection to determine long-term recreational fishery trends exists in Australia - despite the ongoing publication of survey results which show the importance of recreational fisheries in coastal waters.

Of the nine individual species analysed, the recreational share of the State harvest (within the study area and for boat fishing only) varied between 4.7% and 74.9%, although the majority were between 13% and 35%. It is clear that the recreational harvest of many species is sufficiently large to demand its incorporation into stock assessments and fisheries management and planning. In some cases, particularly when considered over smaller spatial scales, the recreational harvest is the dominant component.

The survey estimated a significant overall annual recreational harvest of 3.75 million fish, excluding some of the shellfish bait species. This figure also excludes those fish which were caught but returned to the water. The harvest was numerically dominated by a few species but included a long list of other species which were retained in the catch in small numbers.

The popularity of King George whiting as a target species was clearly demonstrated in this study. It was the most commonly targeted species for recreational anglers in both Gulfs and the West Coast, and in Spencer Gulf and the West Coast for commercial line fishers. It also ranked highly for the commercial net fishery, particularly in West Coast waters (primarily in Coffin Bay) and Spencer Gulf.

The recreational share of the King George whiting harvest generally decreased away from the main population centres and/or holiday areas. The relative share was highest near Adelaide and the central-east coast of Spencer Gulf. The recreational harvest in the heavily fished waters of Gulf St Vincent was of similar magnitude to the commercial catch although some spatial differences were apparent. A large component of the commercial catch was taken at the top of the Gulf where recreational effort and harvest was low. In contrast, the largest component of the recreational harvest was taken from waters adjacent to Adelaide, where the commercial catch was relatively lower.

The pattern of recreational catches in Spencer Gulf generally followed that of fishing effort, with the highest catches being taken along the eastern coast. In addition to several medium size country towns, this is a popular holiday area due to its proximity to Adelaide. The pattern of recreational catches was more closely matched by the commercial sector than was the case in Gulf St Vincent, although some differences were evident. West Coast catches were dominated by those from Coffin, Streaky and Denial/Smoky Bays for both the commercial and recreational sectors, although the relative importance of each area varied between the two.

To properly consider these results further, the life history of the individual species needs to be considered together with the spatial pattern of the recreational and commercial harvests. A comparative analysis of the size and age structures of these catches would enable a more complete assessment of the relative impacts of the spatial pattern of resource use by each sector.

Sea garfish was also a highly targeted species by both the recreational and commercial netting sectors. However, the overall recreational share of the garfish harvest was much smaller than for King George whiting. The commercial catch is mostly caught by haul nets in shallow seagrass areas in the northern parts of each Gulf, whereas the recreational catch is taken mainly in the central and southern parts of the Gulfs (particularly Adelaide and south-east Spencer Gulf). Movement patterns are not known for this species and so the relative impacts of each fishing sector cannot be estimated.

The recreational harvests of blue swimmer crabs, Australian salmon, Australian herring and calamary all have significant but unquantified shore-based catches which are not represented in the estimates in this report. For the first two species in particular, the shore-based catch may be of similar magnitude to (or even exceed) the boat catches reported here. Studies of these fisheries should be given high priority for future research and monitoring.

The recreational harvest of blue mackerel exceeded the relatively small commercial harvest of this species. It is likely that the recreational harvest of other species with low commercial value (e.g. sweep, trevally) may also exceed the commercial catch. Further analyses of these species will be reported elsewhere as they become available.

The relative share of the total harvest by each sector is (to some degree) the cumulative result of the many management measures which are currently in place in the Scalefish Fishery. These include a limited entry commercial fishery, gear restrictions, area closures and size limits which affect both sectors, and bag limits for the recreational fishery. In general, the aim of these measures has not been the deliberate re-allocation of resources from one sector to another, but has been related to resource sustainability. Quantification of the current resource sharing allocation from this report will allow the flow-on effects of future management decisions to be more accurately estimated.

The availability of these data will provide a valuable and significant input into the current process of developing management plans for the fishery. In addition, the biological data are already being used to support and assist biological research programmes on several of the species highlighted in this report. The spatial patterns of recreational fishing and boating have also been used by planning authorities engaged in marine infrastructure and local councils to assess the suitability of current and the need for future facilities.

The results of this project will greatly assist the design of future surveys to explicitly address issues for individual species or areas. The results clearly show where sampling needs to be directed both spatially and temporally. Future surveys of this magnitude could produce estimates with greater precision by allocating sampling effort more directly to seasons and areas with the greatest variability.

The precision levels obtained in this study were encouraging given the large spatial scale of the study area and the inherent variability in recreational fishery data. The high precision levels will enable trends and/or changes in recreational effort, HPUE and harvest to be more readily detected and support the efficacy of the bus-route method.

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REFERENCES

Bertoni, M.D. (1995). Fishery, reproductive biology, feeding and growth of the snook (SHYRAENIDAE: *Sphyraena novaehollandiae*) in South Australia. Unpubl. M. Appl. Sc. (Fisheries) thesis, Australian Maritime College, 172 pp.

Caputi, N. (1976). Creel census of amateur line fishermen in the Blackwood River estuary, Western Australia, during 1974-75. Australian Journal of Marine and Freshwater Research, 27, 583-593.

Cochran, W. G. 1977. Sampling techniques. (3rd ed.). New York: John Wiley & Sons.

Crone, P. R. & Malvestuto, S. P. (1991). Comparison of five estimators of fishing success from creel survey data on three Alabama reservoirs. American Fisheries Society Symposium, 12, 61-66.

Jones, C. M., Robson, D. S., Otis, D., & Gloss, S. (1990). Use of a computer simulation model to determine the behaviour of a new survey estimator of recreational angling. Transactions of the American Fisheries Society, 119, 41-54.

Jones, C. M., & Robson, D. S. (1991). Improving precision in angler surveys: traditional access design versus bus route design. American Fisheries Society Symposium, 12, 177-188.

Jones, C.M., Robson, D.S., Lakkis, H.D. & Kressel, J. (1995). Properties of catch rates used in analysis of angler surveys. Transactions of the American Fisheries Society 124:911-928.

Jones, G. K. (1981). An assessment of recreational boat angling effort. SAFIC, 5(6): 12:13.

Kinloch, M.A., McGlennon, D., Nicoll, G. & Pike, P.G. (ms sub). Evaluation of the bus-route creel survey method in a large Australian marine recreational fishery: I Computer simulations. Fisheries Research.

Ling, J. (1958). The sea garfish (*Reporhamphus melanochir*) (Cuvier & Valenciennes) (Hemirhamphidae), in South Australia: breeding, age determination and growth rate. Australian Journal of Marine and Freshwater Research 9:60-110.

Malcolm, W.B. (1966). Synopsis for F.A.O. species and stocks thesaurus of data on *Arripis trutta* (Bloch and Schneider). In "Commonwealth-States Fisheries Conference, Southern Pelagic Project Committee, Technical session, Cronulla, 1966". Vol. 3, SPP(T)66/1, CSIRO, Australia.

Malvestuto, S. P. (1983). Sampling the recreational fishery. In L. A. Nielsen & D. L. Johnson (Eds.), Fisheries Techniques. (pp. 397-419). Bethseda, Maryland: American Fisheries Society.

McGlennon, D., & Kinloch, M. A. (ms sub). Evaluation of the bus-route creel survey method in a large Australian marine recreational fishery: II Pilot surveys and optimal sampling allocation. Fisheries Research.

Philipson, M., Byrne, J., & Rohan, G. (1986). Participation in recreational fishing in South Australia. Fisheries Research Paper, Department of Fisheries, South Australia, No. 16.

Pollock, K. H., Jones, C. M., & Brown, T. L. (1994). Angler survey methods and their application in fisheries management. American Fisheries Society Special Publication 25.

Potter, I.C., Chrystal, P.J. and Loneragan, N.R. (1983). The biology of the blue manna crab (*Portunus pelagicus*) in an Australian estuary. Marine Biology 78:75-85.

Robson, D. S., & Jones, C. M. (1989). The theoretical basis of an access site angler survey design. Biometrics, 45, 83-96.

SAS Institute Inc. (1995). JMP Statistics and Graphics Guide. Cary, NC: SAS Institute Inc.

Smith, H.A. (1983). The development potential of the southern calamary squid (*Sepioteuthis australis*) fishery. Internal Report No. 101, South Australian Department of Fisheries.

Underwood, A. J. (1981). Techniques of analysis of variance in experimental marine biology and ecology. Oceanography and Marine Biology Annual Review, 19, 513-605.

West, R.J. & Gordon, G.N.G. (1994). Commercial and recreational harvest of fish from two Australian coastal rivers. Australian Journal of Marine and Freshwater Research 45:1259-1279.

BENEFITS

The South Australian Marine Scalefish Fishery is the primary beneficiary of this study. Management of the fishery can now be based on an understanding of the true level of resource sharing between the commercial and recreational boat sectors. It is anticipated that many issues of conflict can now be resolved more readily and equitably because of the existence of these data.

The successful transfer of the intellectual property gained during this study to other researchers in the field means that other similar Australian fisheries will benefit from the use of a cost-effective survey method. It has already been used in fisheries which have previously been considered too costly to survey.

INTELLECTUAL PROPERTY

The intellectual property developed during this project was a) a comprehensive understanding of the performance of the survey method in a large-scale marine fishery (no previous record of its use reported in the literature) and b) an extensive database on the marine recreational boat fishery in South Australia.

FURTHER DEVELOPMENT

The intellectual property associated with the use of the bus-route method has been disseminated at the Workshop previously described. The work will be more formally presented in refereed papers to be submitted. The recreational fishery results will also be published in refereed papers.

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FINAL COST

The total cost of the project is estimated at $626,761 and was expended as follows:

	1993/94	1994/95	1995/96	1996/97	TOTAL
FRDC	48,165	191,710	166,537		406,412
SARDI	29,139	92,140	74,070	25,000	220,349
TOTAL	77,304	283,850	240,607	25,000	626,761

The FRDC revenue was expended entirely on the salary of survey staff and the operating expenses associated with field work. It also included the travelling costs of selected participants at the Cronulla Workshop.

The SARDI component was expended on the salaries of SARDI staff involved in the survey as well as the salary (50%) of the Principal Investigator. The 1996/97 SARDI expenses are those estimated for the Principal Investigator and Project Officer to complete the analyses and Final Report.

DISTRIBUTION LIST

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Table 1. Access sites sampled within each Route and range of wait times

- see Figs 2, 3 and 4 for the location of each Route within the study area.

Route	No	Access site	Days sampled	Range of wait times (minutes)
GULF ST VINCENT				
South-East	1	Victor Harbour	56	40 - 60
(SE)	2	Cape Jervis	56	40 - 90
	3	Wirrina	29	30 - 50
	4	Normanville	39	30 - 50
	5	Aldinga/Sellicks Beach	55	30 - 60
	6	O'Sullivans Beach	57	60 - 80
Metropolitan	7	Glenelg	68	60 - 90
(METRO)	8	North Haven	68	60 - 90
	9	Outer Harbour	68	30 - 40
	10	Garden Island	68	30 - 55
	11	St Kilda	67	45 - 70
North-West	12	Port Wakefield	56	35 - 40
(NW)	13	Price	56	60 - 70
	14	Ardrossan	56	60 - 70
	15	Black Point	41	30 - 40
	16	Port Julia	28	30
	17	Sheoak Flat	32	30
	18	Port Vincent	56	60 - 80
South-West	19	Stansbury	56	60 - 80
(SW)	20	Edithburgh	56	60 - 80
	21	Port Moorowie	14	30
	22	Foul Bay	43	30 - 40
	23	Marion Bay	56	40 - 50
	24	Pondalowie Bay	17	30 - 40
	25	Gleesons Landing	20	30 - 40
WEST COAST				
CENTRAL	64	Elliston	15	50
	65	Anxious Bay	30	40 - 60
	66	Venus Bay	30	70 - 90
	67	Baird Bay	30	40 - 60
	68	Sceale Bay	30	40 - 60
NORTHERN	69	Moors Landing	30	70 - 90
	70	Streaky Bay Yacht Club	23	30
	71	Haslam	17	40
	72	Smoky Bay	30	50 - 60
	73	Thevenard	30	40 - 50
	74	Ceduna	30	50 - 100

Table 1 (cont.) Access sites and wait times

Route	No	Access site	Days sampled	Range of wait times (minutes)
SPENCER GULF				
South-East	26	Corny Point	47	30 - 50
(SE)	27	The Pines	52	30 - 50
	28	Pt Souttar	22	30 - 35
	29	Pt Turton	52	60 - 70
	30	Hardwicke Bay	52	45 - 60
	31	Port Minlacowie	26	30 - 45
	32	Bluff Beach	13	30 - 40
	33	Port Rickaby	12	30 - 40
	34	Port Victoria	52	60 - 85
Central-East	35	Port Hughes	62	90 - 105
(CE)	36	Wallaroo	62	80 - 105
	37	Tickera	31	30 - 40
	38	Port Broughton	62	80 - 105
	39	Fishermans Bay	62	35 - 50
North-East	40	Port Davis	49	30 - 50
(NE)	41	Port Pirie	55	70 - 100
	42	Port Germein	22	30 -40
	43	Chinamans Creek	19	30 - 40
	44	Port Augusta	55	60 - 80
	45	Blanche Harbour	49	15 - 45
North-West	46	Point Lowly	55	40 - 60
(NW)	47	Whyalla	60	80 - 100
	48	Lucky Bay	53	30 - 55
	49	Cowell	60	65 - 90
Central-West	50	Arno Bay	47	30 - 60
(CW)	51	Port Neill	47	60 - 90
	52	Dog Fence	15	40
	53	Tumby Bay	47	70 - 85
	54	2nd Creek	47	30 - 55
	55	Louth Bay	47	40 - 50
South-West	56	North Shields	37	25 - 40
(SW)	57	Stenross Slip	59	45 - 65
	58	Snapper Point	11	20
	59	Billy Lights Point	59	60 - 95
	60	Proper Bay	21	20
	61	Taylors Landing	22	35 - 50
	62	Coffin Bay	59	70 - 90
	63	Farm Beach	59	60 -85
KANGAROO ISLAND	75	Penneshaw	12	70
	76	American Beach	12	40
	77	American River	12	80
	78	Brownlow Beach	3	20
	79	Kingscote	12	75-80
	80	Emu Bay	12	65

Table 2. Seasonal strata - days sampled and number of interviews

SEASONS	Apr-May		Jun-Aug		Sept-Oct		Nov-Dec 25		Dec 26-Jan		Feb-Mar		Total	
DAYS	61		92		61		55		37		59		365	
	Days sampled	No. ints	Days sampled	No. ints	Days sampled	No. ints	Days sampled	No. ints	Days sampled	No. ints	Days sampled	No. ints	Days sampled	No. ints
GULF ST VINCENT														
SE	12	83	9	26	10	46	10	88	7	75	8	40	56	358
METRO	16	185	10	104	12	150	12	145	8	159	10	150	68	893
NW	12	68	9	25	10	37	10	16	7	58	8	43	56	247
SW	12	83	9	45	10	45	10	24	7	49	8	33	56	279
TOTAL	**52**	**419**	**37**	**200**	**42**	**278**	**42**	**273**	**29**	**341**	**34**	**266**	**236**	**1777**
SPENCER GULF														
SW	11	75	12	26	10	31	10	31	7	43	9	53	59	259
CW	7	17	8	17	8	15	8	6	7	22	9	30	47	107
NW	11	89	12	48	10	43	10	39	7	67	10	63	60	349
NE	11	43	12	35	8	19	9	11	7	17	8	17	55	142
CE	11	79	12	97	10	66	9	37	9	118	11	92	62	489
SE	9	37	10	12	8	21	8	32	8	63	9	28	52	193
TOTAL	**60**	**340**	**66**	**235**	**54**	**195**	**54**	**156**	**45**	**330**	**56**	**283**	**335**	**1539**
WEST COAST														
CENTRAL	5	24	7	3	4	8	4	11	4	23	6	20	30	89
NORTH	5	22	7	10	4	6	4	13	4	25	6	32	30	108
TOTAL	**10**	**46**	**14**	**13**	**8**	**14**	**8**	**24**	**8**	**48**	**12**	**52**	**60**	**197**
STATE TOTAL	**244**	**805**	**117**	**448**	**104**	**487**	**104**	**453**	**82**	**719**	**102**	**607**	**631**	**3513**

Table 3. Seasonal fishing day lengths and duration of shifts (hours)

- morning and afternoon shifts were of equal duration

		SEASONS					
		Apr-May	**Jun-Aug**	**Sept-Oct**	**Nov-Dec 25**	**Dec 26-Jan**	**Feb-Mar**
GULF ST VINCENT							
Fishing day length		0700 - 1900	0900 - 1800	0800 - 1900	0700 - 2000	0700 - 2200	0700 - 2000
Shift length		8	6	7	8	8	8
SPENCER GULF							
Fishing day	SE	0700 - 1900	0830 - 1830	0800 - 1930	0730 - 1930	0600 - 2100	0700 - 2000
Shift length		8	6.5	7	7	8	8
	CE	0700 - 1900	0830 - 1830	0800 - 2030	0600 - 2200	0600 - 2200	0700 - 2100
		8	6.5	7	7	8	8
	NE	0700 - 1900	0830 - 1830	0800 - 2030	0600 - 2200	0600 - 2200	0700 - 2100
		8	6.5	7.5	7	8	8
	NW	0700 - 1900	0830 - 1830	0700 - 2000	0600 - 2200	0600 - 2200	0700 - 2100
		8	6.5	8	8	8	8
	CW	0700 - 1900	0830 - 1830	0800 - 1900	0700 - 2000	0600 - 2030	0700 - 1930
		8	6.5	7	7	8	7
	SW	0700 - 1900	0800 - 1900	0730 - 2000	0600 - 2200	0600 - 2200	0700 - 2100
		8	8	8	8	9	7
WEST COAST							
Fishing day length		0700 - 1900	0830 - 1830	0800 - 1930	0700 - 2000	0600 - 2030	0700 - 1800
Shift length		8	6.5	7	7	8	7

Table 4. Length-weight relationships used to convert harvest in numbers to weight.

- lengths are total lengths except [1] fork length, [2] mantle length, [3] carapace width

Species	Length-weight	Source
King George whiting (*Sillaginodes punctata*)	$W(g) = 1.99 \times 10^{-6} * L(mm)^{3.19}$	A.J. Fowler, unpubl. data
Southern sea garfish [1] (*Hyporhamphus melanochir*)	$W(g) = 3.188 \times 10^{-3} * L(cm)^{3.125}$	Ling, 1958
Calamary [2] (*Sepioteuthis australis*)	$W(g) = 8.9 \times 10^{-2} * L(cm)^{2.7}$	Smith, 1983
Blue swimmer crab [3] (*Portunus pelagicus*)	$W(g) = 5.97 \times 10^{-5} * L(mm)^{3.056}$ ♀ $W(g) = 2.56 \times 10^{-5} * L(mm)^{3.26}$ ♂	Potter *et al*., 1983
Australian herring (*Arripis georgiana*)	$W(g) = 2.05 \times 10^{-6} * L(cm)^{3.32}$	D. McGlennon, unpubl. data
Snook (*Sphyraena novaehollandiae*)	$W(g) = 3.5 \times 10^{-3} * L(cm)^{3.05}$	Bertoni, 1995
Australian salmon (*Arripis truttacea*)	$W(g) = 7.45 \times 10^{-3} * L(cm)^{3.111}$	Malcolm, 1966
Snapper [1] (*Pagrus auratus*)	$W(g) = 1.56 \times 10^{-5} * L(cm)^{3.0}$	Jones *et al*., 1990
Blue mackerel (*Scomber australasicus*)	$W(g) = 6.14 \times 10^{-6} * L(cm)^{3.07}$	D. McGlennon, unpubl. data

Table 5. Proportion of recreational fishing effort to total boating effort within each season and Route

	SEASONS					
	Apr-May	Jun-Aug	Sept-Oct	Nov-Dec 25	Dec 26-Jan	Feb-Mar
GULF ST VINCENT						
SE	0.891	0.7	0.82	0.71	0.81	0.78
METRO	0.908	0.9	0.85	0.86	0.91	0.88
NW	0.918	0.79	0.72	0.59	0.86	0.81
SW	0.951	0.86	0.8	0.9	0.9	0.87
SPENCER GULF						
SE	0.914	0.708	0.846	0.764	0.898	0.768
CE	0.83	0.82	0.851	0.75	0.794	0.837
NE	0.776	0.773	0.727	0.647	0.7	0.694
NW	0.729	0.756	0.714	0.75	0.826	0.742
CW	0.744	0.75	0.731	0.565	0.796	0.754
SW	0.659	0.522	0.691	0.711	0.824	0.784
WEST COAST						
CENTRAL	0.8	0.25	0.579	0.65	0.921	0.889
NORTHERN	0.629	0.357	0.467	0.559	0.738	0.587

Table 6. Recreational boat fishing effort (boathours)

a) Gulf St Vincent (April 1994 to March 1995). Data show estimates (with SE in parentheses) for each season and Route. Totals for each season and Route and the coefficient of variation (CV) for the estimate are also shown.

	SEASON						ANNUAL	
ROUTE	**APR-MAY**	**JUN-AUG**	**SEP-OCT**	**NOV-DEC 25**	**DEC 26-JAN**	**FEB-MAR**		**CV**
GULF ST VINCENT								
SE	19569	4274	14591	16254	21602	13489	**89779**	
	(7647)	(1372)	(6536)	(4521)	(6901)	(4760)	**(13921)**	**15.5**
METRO	47990	45295	37050	34874	74820	61236	**301265**	
	(13381)	(18689)	(9032)	(10768)	(22434)	(16725)	**(38844)**	**12.9**
NW	13864	10013	6705	3348	20139	11464	**65533**	
	(4585)	(3113)	(2323)	(871)	(5944)	(2454)	**(8845)**	**13.5**
SW	17681	11652	6247	7108	10420	7021	**60129**	
	(6955)	(2280)	(1383)	(2512)	(5371)	(2172)	**(9765)**	**16.2**
TOTAL	**99104**	**71234**	**64593**	**61584**	**126981**	**93210**	**516706**	
	(17509)	**(19133)**	**(11471)**	**(11978)**	**(24801)**	**(17696)**	**(43316)**	**8.4**
CV	**17.7**	**26.9**	**17.8**	**19.4**	**19.5**	**19.0**		

Table 6 (cont.). Recreational boat fishing effort (boathours)

b) Spencer Gulf (April 1995 to March 1996). Data show estimates (with SE in parentheses) for each season and Route. Totals for each season and Route and the coefficient of variation for the estimate are also shown.

	SEASON						ANNUAL	
ROUTE	**APR-MAY**	**JUN-AUG**	**SEP-OCT**	**NOV-DEC 25**	**DEC 26-JAN**	**FEB-MAR**		**CV**
SPENCER GULF								
SW	14301	5751	6475	6396	13769	20362	**67054**	
	(3896)	(1111)	(2474)	(1281)	(3052)	(5566)	**(8029)**	**12.0**
CW	3319	4163	2872	2611	7243	8634	**28842**	
	(725)	(1384)	(844)	(1598)	(1716)	(1422)	**(3267)**	**11.3**
NW	13535	7874	5107	6118	12166	10857	**55657**	
	(1451)	(2418)	(1196)	(2206)	(3252)	(3848)	**(6295)**	**11.3**
NE	16486	11183	7915	3417	6388	9665	**55054**	
	(4747)	(3416)	(2341)	(1007)	(1985)	(3525)	**(7554)**	**13.7**
CE	19772	26420	16293	9739	26196	32388	**130808**	
	(3380)	(6607)	(6767)	(2950)	(7251)	(10177)	**(16301)**	**12.5**
SE	15219	8866	10803	13203	14333	15673	**78097**	
	(8520)	(3119)	(4222)	(2210)	(2955)	(4193)	**(11460)**	**14.7**
TOTAL	**82632**	**64257**	**49465**	**41484**	**80095**	**97579**	**415512**	
	(11151)	**(8605)**	**(8796)**	**(4864)**	**(9385)**	**(13468)**	**(23851)**	**5.7**
CV	**13.5**	**13.4**	**17.8**	**11.7**	**11.7**	**13.8**		

Table 6 (cont.). Recreational boat fishing effort (boathours)

c) West Coast (April 1995 to March 1996). Data show estimates (with SE in parentheses) for each season and Route. Totals for each season and Route and the coefficient of variation for the estimate are also shown.

	SEASON						ANNUAL	
ROUTE	**APR-MAY**	**JUN-AUG**	**SEP-OCT**	**NOV-DEC 25**	**DEC 26-JAN**	**FEB-MAR**		**CV**
WEST COAST								
CENTRAL	4508 (933)	641 (216)	2065 (956)	3588 (2373)	5215 (804)	5171 (910)	**21188** **(2989)**	**14.1**
NORTHERN	7438 (2364)	2439 (868)	1693 (789)	4639 (808)	9553 (2423)	9812 (2259)	**35574** **(4312)**	**12.1**
TOTAL	**11946** **(2542)**	**3080** **(894)**	**3758** **(1240)**	**8227** **(2506)**	**14768** **(2553)**	**14983** **(2436)**	**56762** **(5247)**	**9.2**
CV	**21.3**	**29.0**	**33.0**	**30.5**	**17.3**	**16.3**		
STATE TOTAL	**193682** **(20913)**	**138571** **(20998)**	**117816** **(14508)**	**111295** **(13169)**	**221844** **(26640)**	**205772** **(22371)**	**988980** **(49726)**	
	10.8	**15.2**	**12.3**	**11.8**	**12.0**	**10.9**	**5.0**	

Table 7. Average trip duration for each Route

- seasons pooled

ROUTE	AVERAGE TRIP DURATION (boathours)	SD
GULF ST VINCENT		
SE	5.14	2.42
METRO	5.60	2.32
NW	4.36	1.87
SW	4.43	1.97
SPENCER GULF		
SE	4.73	2.04
CE	5.17	2.48
NE	6.32	3.18
NW	4.79	2.23
CW	4.97	3.09
SW	4.42	1.97
WEST COAST		
CENTRAL	3.40	2.14
NORTHERN	4.57	1.86

Table 8. Comparison of commercial and recreational fishing effort (boatdays)

a) Gulf St Vincent (April 1994 to March 1995)
- data collated by MSF Block (Fig. 2). The ratio is of recreational:commercial boatdays.

	SEASONS						ANNUAL		COMMERCIAL	RATIO
BLOCKS	**APR-MAY**	**JUN-AUG**	**SEP-OCT**	**NOV-DEC 25**	**DEC 26-JAN**	**FEB-MAR**	**HOURS**	**DAYS**	**DAYS**	
GULF ST VINCENT										
34	14973	7714	5935	5202	14416	8802	57042	12940	1472	8.79
35	5258	7574	4468	1493	9852	4233	32879	7398	5225	1.42
36	47770	45698	36698	33178	70478	59984	293805	52594	4256	12.36
43	10477	3905	10733	9569	15770	9714	60168	11594	769	15.08
40	10359	6148	2235	5330	8636	5450	38157	8553	1799	4.75
44	6813	194	4319	4016	6326	3961	25629	4986	2732	1.83
45	3274	0	206	2796	1504	1067	8847	1721	749	2.30
TOTAL	**98924**	**71234**	**64593**	**61584**	**126980**	**93211**	**516527**	**99787**	**17002**	**5.87**

Table 8 (cont.). Comparison of commercial and recreational fishing effort (boatdays)

b) Spencer Gulf (April 1995 to March 1996)
- data collated by MSF Block (Fig. 3). The ratio is of recreational:commercial boatdays.

	SEASONS						ANNUAL		COMMERCIAL	RATIO
BLOCKS	**APR-MAY**	**JUN-AUG**	**SEP-OCT**	**NOV-DEC 25**	**DEC 26-JAN**	**FEB-MAR**	**HOURS**	**DAYS**	**DAYS**	
SPENCER GULF										
11	7776	3901	3936	771	2337	836	19558	3110	234	13.29
19	0	0	203	804	752	511	2270	458	632	0.72
20	3679	2069	2022	1832	926	2919	13447	2805	498	5.63
21	16269	12926	6591	5343	14248	14179	69557	12714	4492	2.83
22	1946	160	848	1589	1042	3071	8656	1806	2038	0.89
23	12572	14611	11605	5132	18024	17897	79841	15425	3246	4.75
29	3259	4138	3217	804	3266	3107	17791	3585	1126	3.18
30	1157	996	571	1288	2779	6435	13225	2782	2016	1.38
31	2361	1667	2834	2350	3804	4800	17816	4008	1349	2.97
32	7551	11809	5398	5282	8206	14596	52844	10269	2541	4.04
33	15219	8866	9170	12529	14300	14931	75014	15836	4011	3.95
TOTAL	**71790**	**61143**	**46395**	**37725**	**69684**	**83283**	**370019**[1]	**72797**	**22813**	**3.19**

[1] this total does not equal that in Table 6 as West Coast Block 27 was surveyed in the SW Spencer Gulf Route (see Fig. 3) but is more appropriately grouped under West Coast

Table 8 (cont.). Comparison of commercial and recreational fishing effort (boatdays)

c) West Coast (April 1995 to March 1996)
- data collated by MSF Block (Fig. 4). The ratio is of recreational:commercial boatdays.

	SEASONS						ANNUAL		COMMERCIAL	RATIO
BLOCKS	**APR-MAY**	**JUN-AUG**	**SEP-OCT**	**NOV-DEC 25**	**DEC 26-JAN**	**FEB-MAR**	**HOURS**	**DAYS**	**DAYS**	
WEST COAST										
8	0	0	0	0	628	0	628	137	1069	0.13
9	4667	1056	940	3027	8153	5462	23304	5099	4140	1.23
10	3021	1382	882	1947	1486	4351	13069	2967	2146	1.38
15	436	232	688	1248	1032	765	4400	1294	554	2.34
16	639	191	387	335	107	0	1658	488	916	0.53
17	3183	218	860	1672	3362	4406	13702	4029	1645	2.45
27	10843	3115	3071	3760	10411	14297	45496	10302	2431	4.24
TOTAL	**22789**	**6194**	**6828**	**11987**	**25179**	**29280**	**102257**[1]	**24316**	**12901**	**1.88**
STATE TOTAL (DAYS ONLY)								**196900**	**52716**	**3.74**

[1] this total does not equal that in Table 6 as West Coast Block 27 was surveyed in the SW Spencer Gulf Route (see Fig. 3) but is more appropriately grouped under West Coast

Table 9. Targeted fishing effort (%) by species for individual Blocks

a) Gulf St Vincent (April 1994 to March 1995)
- species codes can be found in Table 10. REC = recreational fishery, CL = commercial line fishery and CN = commercial net fishery

BLOCK	SECTOR	SPECIES											
		ANY	KGW	GFS	CAL	AH	BSC	SNAP	SAL	SNOOK	SHARK	YEM	OTHER
	REC	3.2	35.8	23.9	18.0	10.1	6.4		0.4	1.6			0.6
34	CL	1.6	70.5		25.9				0.1	1.6			0.3
	CN	12.5	16.0	32.4	8.2	9.5	16.4		1.1	0.4			3.5
	REC	8.5	27.0	9.0	6.4	7.9	15.9	6.3	7.5	2.8		3.2	5.5
35	CL	1.8	32.0	0.8	28.0			27.2	1.1	2.3	5.4		1.4
	CN	49.4	2.6	12.1	8.1	0.4	22.9		0.3	2.8	0.8	0.4	0.2
	REC	6.0	36.4	20.5	9.0	4.2	13.9	2.3	0.9	1.1	0.6	0.8	4.3
36	CL	1.4	42.3	0.2	32.1			6.0	2.4	3.1	5.1		7.4
	CN	23.0	6.1	3.2	2.8	3.3	39.1		1.1	0.5	0.6	11.9	8.4
	REC	6.8	45.3	16.5	9.2	9.4		5.7		2.6			4.5
40	CL	8.1	51.1		2.6	0.1		9.5		15.0	9.9	0.3	3.4
	CN	30.2	18.7	11.1		6.0				1.3	24.5	7.5	0.7
	REC	11.0	30.9	20.2	18.0	4.4		4.4	0.9		1.1		9.1
43	CL	0.2	9.2		76.1			1.2	0.7		9.2		3.4
	CN		21.1	5.5					56.3		6.0	10.1	1.0
	REC	12.1	22.6	16.0	12.8			6.7	1.5	4.2			24.1
44/45	CL	1.3	6.3		50.7			8.9	2.6	2.8	17.3	0.1	10.0
	CN*	22.1		45.2	0.2				3.2		10.9	5.5	12.9

* 12.9% mulloway

Table 9. Targeted fishing effort (%) by species for individual Blocks

b) Spencer Gulf (April 1995 to March 1996)
- species codes can be found in Table 10. REC = recreational fishery, CL = commercial line fishery and CN = commercial net fishery

BLOCK	SECTOR	SPECIES										
		ANY	KGW	GFS	CAL	AH	BSC	SNAP	SAL	SNOOK	SHARK	OTHER
11/21	REC	2.7	40.6	3.1	11.7	1.3	15.2	20.6		0.7	0.1	4.0
	CL	6.0	14.7		2.3			70.2		1.6	0.5	4.7
	CN	17.2	20.8	32.3	0.1	0.1	24.4				0.9	4.2
19/20/22/23	REC	3.7	44.8	10.2	9.1	3.3	13.1	10.5		2.2		3.1
	CL	0.4	30.6		26.7			34.5		3.2	2.1	2.5
	CN	33.9	17.0	20.9	0.2	0.8	20.2			0.8	1.4	4.8
29/32	REC	3.3	51.5	11.4	17.8	2.4	3.3	5.7	0.1	2.9		1.6
	CL	3.5	53.8		27.4			8.5		4.5	1.5	0.8
	CN	79.3	10.8	5.0					0.4	0.7	2.3	1.5
30/31/33	REC	2.5	47.5	13.7	17.1	3.2		6.4	0.4	2.8	0.1	6.3
	CL	3.9	60.3		25.1			5.9		0.9	2.6	1.3
	CN	23.1	31.4	22.1	2.7	1.9					10.5	8.3

Table 9. Targeted fishing effort (%) by species for individual Blocks

c) West Coast (April 1995 to March 1996)
- species codes can be found in Table 10. REC = recreational fishery, CL = commercial line fishery and CN = commercial net fishery

BLOCK	SECTOR	SPECIES											
		ANY	KGW	GFS	CAL	AH	BSC	SNAP	SAL	SNOOK	SHARK	SAND CR	OTHER
	REC	6.39	55.31	5.07	10.79	4.32	3.73	3.73	0.95	3.46			6.25
8/9/10	CL	1.23	79.34		7.87			3.03	0.44	2.57	4.37		1.15
	CN	0.59		7.96		2.36	21.53				64.60		2.96
	REC	7.53	66.62	6.28	2.73	4.24			2.38	1.81			8.41
15/16/17	CL	1.80	95.55		0.17								2.48
	CN	0.52	49.52	28.97							19.95		1.04
	REC	6.89	68.33	10.80	1.30	3.30		1.45	3.33	0.96		0.65	2.99
27	CL	0.58	93.35		1.16						1.61		3.3
	CN	29.15	18.43	10.46							1.96	25.88	14.12

Table 10. Summary of the species (and numbers) of fish recorded in the catch.

- data obtained from interviews in Gulf St Vincent from April 1994 to March 1995 and Spencer Gulf and West Coast waters from April 1995 to March 1996.
* includes a number of species; % = 0.00 signifies a percentage < 0.01.

Common Name	Code	Scientific Name	Gulf St Vincent		Spencer Gulf		West Coast		Total	
			No	%	No	%	No	%	No	%
King George Whiting	KGW	*Sillaginodes punctata*	7105	20.68	9316	36.08	1944	39.22	18365	28.20
Southern Sea Garfish	GFS	*Hyporhamphus melanochir*	8350	24.30	4119	15.95	646	13.03	13115	20.14
Blue Swimmer Crab	BSC	*Portunus pelagicus*	6477	18.85	3278	12.69	54	1.09	9809	15.06
Australian Herring, Tommy Ruff	AH	*Arripis georgiana*	4081	11.88	2121	8.21	668	13.48	6870	10.55
Southern Calamary	CAL	*Sepioteuthis australis*	2057	5.99	1818	7.04	179	3.61	4054	6.22
Striped Perch		*Pelates octolineatus*	356	1.04	1859	7.20	182	3.67	2397	3.68
Leatherjackets*		Monacanthidae	1171	3.41	521	2.02	57	1.15	1749	2.69
Snook	SNOOK	*Sphyraena novaehollandiae*	456	1.33	840	3.25	136	2.74	1432	2.20
Blue Mackerel	MACK	*Scomber australasicus*	877	2.55	234	0.91	48	0.97	1159	1.78
Australian Salmon	SAL	*Arripis truttacea*	470	1.37	120	0.46	266	5.37	856	1.31
Red Mullet	RML	*Upeneichthys vlamingii*	411	1.20	256	0.99	64	1.29	731	1.12
Weedy Whiting		*Haletta semifasciata*	235	0.68	276	1.07	101	2.04	612	0.94
Silver Whiting		*Sillago bassensis*	455	1.32	6	0.02	121	2.44	582	0.89
Yelloweye Mullet	YEM	*Aldrichetta forsteri*	485	1.41	35	0.14	12	0.24	532	0.82
Flathead*		*Neoplatycephalus* spp.	305	0.89	83	0.32	104	2.10	492	0.76
Snapper	SNAP	*Pagrus auratus*	39	0.11	422	1.63	2	0.04	463	0.71
Trevally		*Pseudocaranx* spp.	131	0.38	83	0.32	115	2.32	329	0.51
Sweep		*Scorpis aequipinnis*	91	0.26	82	0.32	91	1.84	264	0.41
Wrasse		Labridae	134	0.39	23	0.09	40	0.81	197	0.30
Cuttlefish		*Sepia* spp.	39	0.11	122	0.47	0	0.00	161	0.25
Yellowtail Scad, Chow		*Trachurus* spp.	113	0.33	44	0.17	0	0.00	157	0.24
Sand Crab	SAC	*Ovalipes bipustulatus*	93	0.27	0	0.00	37	0.75	130	0.20
Rock Crab		*Nectocarcinus integrifrons*	13	0.04	57	0.22	9	0.18	79	0.12
Southern Rock Lobster		*Jasus novaehollandiae*	58	0.17	0	0.00	15	0.30	73	0.11
Barracouta		*Thyrsites atun*	39	0.11	0	0.00	12	0.24	51	0.08

Table 10. Summary of the species (and numbers) of fish recorded in the catch.

- data obtained from interviews in Gulf St Vincent from April 1994 to March 1995 and Spencer Gulf and West Coast waters from April 1995 to March 1996.
* includes a number of species; % = 0.00 signifies a percentage < 0.01.

Common Name	Code	Scientific Name	Gulf St Vincent		Spencer Gulf		West Coast		Total	
			No	%	No	%	No	%		%
Silverbelly		*Parequula melbournensis*	47	0.14	1	0.00	1	0.02	49	0.08
Warehou		*Seriolella brama*	43	0.13	0	0.00	0	0.00	43	0.07
Yellowfin Whiting		*Sillago schomburgkii*	35	0.10	6	0.02	0	0.00	41	0.06
Abalone Greenlip		*Haliotis laevigata*	13	0.04	18	0.07	5	0.10	36	0.06
Flounder		Pleuronectidae	13	0.04	13	0.05	8	0.16	34	0.05
Red Snapper		*Centroberyx gerrardi*	12	0.03	17	0.07	4	0.08	33	0.05
Dusky Morwong		*Dactylophora nigricans*	8	0.02	18	0.07	5	0.10	31	0.05
River Garfish		*Hyporhamphus regularis*	19	0.06	0	0.00	0	0.00	19	0.03
Blue Throated Parrotfish		*Notolabrus tetricus*	15	0.04	1	0.00	2	0.04	18	0.03
Black Bream		*Acanthopagrus butcheri*	16	0.05	0	0.00	0	0.00	16	0.02
Port Jackson Shark		*Heterodontus portusjacksoni*	4	0.01	11	0.04	0	0.00	15	0.02
Bluedevil		*Paraplesiops meleagris*	11	0.03	2	0.01	0	0.00	13	0.02
Peterfish		*Caesioperca rasor*	0	0.00	0	0.00	11	0.22	11	0.02
Swallowtail		*Centroberyx lineatus*	11	0.03	0	0.00	0	0.00	11	0.02
Abalone Blacklip		*Haliotis rubra*	10	0.03	0	0.00	0	0.00	10	0.02
Rays & Skates		Rhinobatidae, Urolophidae	7	0.02	2	0.01	0	0.00	9	0.01
Silver Drummer		*Kyphosus sydneyanus*	3	0.01	6	0.02	0	0.00	9	0.01
Spider Crab		*Naxia* spp.	3	0.01	0	0.00	5	0.10	8	0.01
Red Gurnard		*Chelidonichthys kumu*	6	0.02	1	0.00	0	0.00	7	0.01
Octopus	OCTO	*Octopus* spp.	3	0.01	1	0.00	3	0.06	7	0.01
School & Gummy Shark	SHARK	*Galeorhinus galeus, Mustelus antarcticus*	4	0.01	3	0.01	0	0.00	7	0.01
Bronze Whaler Shark	SHARK	*Carcharhinus brachyurus*	4	0.01	2	0.01	0	0.00	6	0.01
Rough Bullseye		*Pempheris klunzingeri*	6	0.02	0	0.00	0	0.00	6	0.01
Moonlighter		*Tilodon sexfasciatum*	2	0.01	0	0.00	3	0.06	5	0.01
Queen Snapper, Blue Morwong		*Nemadactylus douglasii*	3	0.01	0	0.00	2	0.04	5	0.01
Magpie Perch		*Cheilodactylus nigripes*	4	0.01	0	0.00	0	0.00	4	0.01

Table 10. Summary of the species (and numbers) of fish recorded in the catch.

- data obtained from interviews in Gulf St Vincent from April 1994 to March 1995 and Spencer Gulf and West Coast waters from April 1995 to March 1996.
* includes a number of species; % = 0.00 signifies a percentage < 0.01.

Common Name	Code	Scientific Name	Gulf St Vincent		Spencer Gulf		West Coast		Total	
			No	%	No	%	No	%		%
Slimy / Bearded Cod		*Pseudophycis barbata*	1	0.00	0	0.00	3	0.06	4	0.01
Toad Fish		Tetraodontidae	3	0.01	0	0.00	0	0.00	3	0.00
Zebrafish		*Girella zebra*	3	0.01	0	0.00	0	0.00	3	0.00
Cowfish		*Aracana* spp.	1	0.00	2	0.01	0	0.00	3	0.00
Southern Bluefin Tuna		*Thunnus maccoyii*	0	0.00	2	0.01	0	0.00	2	0.00
Old Wife		*Enoplosus armatus*	2	0.01	0	0.00	0	0.00	2	0.00
Morteon Bay Bug		*Ibacus incisus*	0	0.00	1	0.00	0	0.00	1	0.00
Harlequin Fish		*Othos dentex*	0	0.00	0	0.00	1	0.02	1	0.00
Long-Snouted Boarfish		*Pentaceropsis recurvirostris*	0	0.00	0	0.00	1	0.02	1	0.00
Long-finned Pike		*Dinolestes lewini*	1	0.00	0	0.00	0	0.00	1	0.00
Senator Wrasse		*Pictilabrus laticlavius*	1	0.00	0	0.00	0	0.00	1	0.00
Wobbegong Shark		Orectolobidae	1	0.00	0	0.00	0	0.00	1	0.00
Total			**34356**		**25822**		**4957**			

Table 11. Summary of species of shellfish collected for bait and/or food.

- in some cases, numbers were approximated from holding containers.

Common Name	Scientific Name	Gulf St Vincent	Spencer Gulf	West Coast	Total
Cockles	*Katylesia* Spp.	3059	1243	36	4338
Scallops	*Pecten benedictus albus, Chlamys bifrons*	845	401	94	1340
Razorfish	*Pinna bicolor*	532	1293	1422	3247
Mussels	*Mytilus edulis planulatus*	100	450	400	950
Total		**4536**	**3387**	**1952**	**9875**

Table 12. Recreational harvest (numbers) of King George whiting (*Sillaginodes punctata*)

- SE in parentheses

	SEASON						ANNUAL	
ROUTE	**APR-MAY**	**JUN-AUG**	**SEP-OCT**	**NOV-DEC 25**	**DEC 26-JAN**	**FEB-MAR**		**CV**
GULF ST VINCENT								
SE	9110 (9870)	1543 (952)	9835 (7943)	4806 (1503)	6098 (4481)	2152 (3111)	**33545** **(13910)**	**41.5**
METRO	54312 (35726)	61445 (79642)	31214 (31156)	15793 (10797)	27154 (18334)	29696 (31680)	**219616** **(100231)**	**45.6**
NW	9026 (8657)	20742 (23025)	7410 (10021)	4273 (3879)	18755 (11709)	9512 (10554)	**69719** **(31130)**	**44.7**
SW	20089 (11371)	35066 (21595)	6189 (3713)	8485 (9084)	11745 (7510)	9030 (6401)	**90604** **(28095)**	**31.0**
TOTAL	**92539** **(39724)**	**118797** **(85675)**	**54649** **(33882)**	**33357** **(14710)**	**63752** **(23447)**	**50390** **(34142)**	**413484** **(109536)**	**26.5**
CV	**42.9**	**72.1**	**62.0**	**44.1**	**36.8**	**67.8**		

Table 12 (cont). King George whiting harvest

- SE in parentheses; * seasons pooled due to low interview numbers

	SEASON						ANNUAL	
ROUTE	**APR-MAY**	**JUN-AUG**	**SEP-OCT**	**NOV-DEC 25**	**DEC 26-JAN**	**FEB-MAR**		**CV**
SPENCER GULF								
SW	56919	15298	3367	5309	16110	34616	**131618**	
	(36996)	(9852)	(4924)	(1568)	(8019)	(18545)	**(43597)**	**33.1**
CW	8796	7869	14052*	*	11807	13038	**55562**	
	(7406)	(3180)	(13532)*	*	(9615)	(8514)	**(20323)**	**36.6**
NW	24768	16850	7405	4956	8151	8903	**71033**	
	(11232)	(12075)	(3732)	(4165)	(7463)	(6798)	**(20128)**	**28.3**
NE	44019	24492	7915	0	64	2126	**78616**	
	(52102)	(16478)	(8040)		(19)	(4105)	**(55386)**	**70.5**
CE	18190	68428	18900	8084	14932	39837	**168371**	
	(9246)	(43092)	(11166)	(8547)	(9071)	(21873)	**(51970)**	**30.9**
SE	11871	13387	15880	10167	16770	38398	**106473**	
	(16978)	(13088)	(14615)	(6063)	(8829)	(30193)	**(41225)**	**38.7**
TOTAL	**164563**	**146325**	**67520**	**28514**	**67833**	**136918**	**611673**	
	(68104)	**(50525)**	**(24984)**	**(11385)**	**(19305)**	**(43238)**	**(100930)**	**16.5**
CV	**41.4**	**34.5**	**37.0**	**39.9**	**28.5**	**31.6**		

Table 12 (cont). King George whiting harvest

- SE in parentheses; * seasons pooled due to low interview numbers

	SEASON						ANNUAL	
ROUTE	**APR-MAY**	**JUN-AUG**	**SEP-OCT**	**NOV-DEC 25**	**DEC 26-JAN**	**FEB-MAR**		**CV**
CENTRAL	7833	6281*	*	7025	3640	12807	**37586**	
	(2639)	(7804)*	*	(5785)	(1860)	(4811)	**(11311)**	**30.1**
NORTH	10415	3499*	*	14196	35060	28749	**91919**	
	(5070)	(4709)*	*	(9782)	(15139)	(11298)	**(22370)**	**24.3**
TOTAL	**18248**	**9780***	*****	**21221**	**38700**	**41556**	**129505**	
	(5716)	**(9115)***	*****	**(11364)**	**(15253)**	**(12280)**	**(25067)**	**19.4**
CV	**31.3**	**93.2**		**53.6**	**39.4**	**29.6**		
STATE TOTAL	**275350**	**274902**	**122169**	**83092**	**170285**	**228864**	**1154662**	
	(79050)	**(99880)**	**(42097)**	**(21798)**	**(33987)**	**(56445)**	**(151041)**	**13.1**
	28.7	**36.3**	**34.5**	**26.2**	**20.0**	**24.7**		

Table 13. Comparison of the recreational and commercial harvest (tonnes) of King George whiting (*Sillaginodes punctata*) by MSF Block

- Gulf St Vincent (April 1994 to March 1995), Spencer Gulf and West Coast (April 1995 to March 1996)
- [1] these totals do not correspond to the totals in Table 12 as Block 27 in West Coast was surveyed within a Spencer Gulf Route (SW) (see Fig. 3) - the sum of the two equals those in Table 12

BLOCKS	RECREATIONAL (R)		COMMERCIAL (C)	ALLOCATION (%)
	Nos	tonnes	tonnes	R:R+C
34	79066	20.1	18.9	51.5
35	26675	5.0	37.0	11.9
36	218153	40.3	17.8	69.4
40	55138	15.4	16.6	48.1
43	20504	4.3	0.4	91.5
44/45	13948	4.3	1.5	74.1
GULF ST VINCENT	**413484**	**89.4**	**92.2**	**49.2**
11	8702	1.6	36.4	39.4
21	101086	22.1		
19	7787	2.2	4.8	31.4
20	19181	3.8	6.1	38.4
22	18277	4.9	27.7	15.0
23	72236	17.3	21.7	44.4
29	38846	11.5	16.4	41.2
30	19332	6.1	20.9	22.6
31	16257	4.3	9.4	31.3
32	98502	30.2	25.5	54.2
33	101283	28.4	52.3	35.2
SPENCER GULF	**501489[1]**	**132.3**	**221.2**	**37.4**
8	3824	0.9	10.6	7.8
9	65307	13.8	71.1	16.3
10	24908	6.4	30.9	17.2
15	6782	1.7	2.0	45.9
16	5511	1.3	16.3	7.4
17	23173	2.8	14.9	15.8
27	110184	21.3	54.5	28.1
WEST COAST	**239689[1]**	**48.2**	**200.3**	**19.4**
STATE	**1154662**	**269.9**	**513.7**	**34.4**

Table 14. Recreational harvest (numbers) of southern sea garfish (*Hyporhamphus melanochir*)

- SE in parentheses

	SEASON						ANNUAL	
ROUTE	**APR-MAY**	**JUN-AUG**	**SEP-OCT**	**NOV-DEC 25**	**DEC 26-JAN**	**FEB-MAR**		**CV**
GULF ST VINCENT								
SE	4435 (8546)	94 (111)	324 (866)	11428 (13845)	21017 (15561)	23536 (18191)	60834 (28957)	47.6
METRO	34067 (40181)	7658 (14946)	24632 (19382)	53020 (39971)	142971 (96279)	38760 (21779)	301108 (116427)	38.7
NW	2978 (3592)	0 (0)	857 (1748)	1355 (2575)	17107 (10830)	30584 (16413)	52881 (20230)	38.3
SW	31405 (24906)	801 (1636)	3985 (8869)	7668 (10272)	19447 (14213)	5243 (6455)	68549 (32416)	47.3
TOTAL	**72885** **(48174)**	**8553** **(15036)**	**29797** **(21404)**	**73470** **(43606)**	**200543** **(99152)**	**98123** **(33411)**	**483371** **(125912)**	**26.0**
CV	**66.1**	**175.8**	**71.8**	**59.4**	**49.4**	**34.1**		

Table 14 (cont.). Harvest (numbers) of southern sea garfish (*Hyporhamphus melanochir*)

- SE in parentheses, * seasons pooled due to low interview numbers

	SEASON						ANNUAL	
ROUTE	**APR-MAY**	**JUN-AUG**	**SEP-OCT**	**NOV-DEC 25**	**DEC 26-JAN**	**FEB-MAR**		**CV**
SPENCER GULF								
SW	12183 (14487)	1403 (3879)	1020 (2011)	1919 (1539)	3257 (3169)	6207 (8744)	25988 (17828)	68.6
CW	0 (0)	0 (0)	312* (1078)*	* *	3378 (4895)	3571 (4488)	7261 (6728)	92.7
NW	789 (1125)	0 (0)	425 (593)	8361 (24646)	3972 (6722)	2405 (2254)	15951 (25677)	161.0
NE	1459 (2473)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1459 (2473)	169.5
CE	6917 (16571)	812 (2087)	266 (331)	15858 (23721)	51503 (34057)	40557 (46862)	115912 (64789)	55.9
SE	1259 (2722)	798 (1423)	4927 (10314)	9262 (11137)	36694 (19939)	24022 (31740)	76962 (40557)	52.7
TOTAL	**22606 (22344)**	**3013 (4629)**	**6949 (10585)**	**35399 (36007)**	**98804 (40455)**	**76761 (57491)**	**243533 (82892)**	**34.0**
CV	**98.8**	**153.6**	**152.3**	**101.7**	**40.9**	**74.9**		

Table 14 (cont.). Harvest (numbers) of southern sea garfish (*Hyporhamphus melanochir*)

- SE in parentheses, * seasons pooled due to low interview numbers

	SEASON						ANNUAL	
ROUTE	**APR-MAY**	**JUN-AUG**	**SEP-OCT**	**NOV-DEC 25**	**DEC 26-JAN**	**FEB-MAR**		**CV**
WEST COAST								
CENTRAL	56	0*	*	1589	1570	370	3585	
	(10613)	(0)*	*	(2889)	(2470)	(586)	(11289)	314.9
NORTH	5471	3781*	*	672	97	1876	11897	
	(9724)	(5082)*	*	(1377)	(199)	(4761)	(12041)	101.2
TOTAL	**5527**	**3781***	*****	**2261**	**1667**	**2247**	**15482**	
	(14394)	**(5082)***	*****	**(3201)**	**(2478)**	**(4797)**	**(16505)**	**106.6**
CV	**260.4**	**134.4**		**141.5**	**148.7**	**213.5**		
STATE TOTAL	**101018**	**15347**	**36746**	**111130**	**301014**	**177131**	**742386**	
	(55019)	**(16533)**	**(23878)**	**(56641)**	**(107116)**	**(66667)**	**(151648)**	**20.4**
	54.5	**107.7**	**65.0**	**51.0**	**35.6**	**37.6**		

Table 15. Comparison of the recreational and commercial harvest (tonnes) of southern sea garfish (*Hyporhamphus melanochir*) by MSF Block

- Gulf St Vincent (April 1994 to March 1995), Spencer Gulf and West Coast (April 1995 to March 1996)
- [1] these totals do not correspond to the totals in Table 14 as Block 27 in West Coast was surveyed within a Spencer Gulf Route (SW) (see Fig. 3) - the sum of the two equals those in Table 14

BLOCKS	RECREATIONAL (R)		COMMERCIAL (C)	ALLOCATION (%)
	Nos	tonnes	tonnes	R:R+C
34	80564	7.5	22.7	24.8
35	4675	0.4	98.2	0.4
36	279019	23.1	18.0	61.7
43	62248	5.9		
40	38005	4.0	5.6	41.7
44	12403	1.0	29.2	4.9
45	6458	0.5		
GULF ST VINCENT	**483372**	**42.4**	**173.7**	**19.6**
11, 21	5946	0.5	92.6	0.5
19	0	0	5.5	0
20, 22	11616	0.8	34.7	2.3
23	57727	4.0	41.7	8.8
29, 30, 31	11181	1.3	13.9	8.6
32	58033	4.7	11.9	28.3
33	76962	7.0	17.0	29.2
SPENCER GULF	**221465[1]**	**18.3**	**217.3**	**7.8**
8, 9, 10	11897	1.2	8.9	11.9
15, 16, 17	3585	0.3	21.9	1.4
27	22068	1.9	3.8	33.3
WEST COAST	**37550[1]**	**3.4**	**34.6**	**8.9**
STATE	**742387**	**64.1**	**425.6**	**13.1**

Table 16. Recreational harvest (numbers) of southern calamary (*Sepioteuthis australis*)

- SE in parentheses

	SEASON						ANNUAL	
ROUTE	**APR-MAY**	**JUN-AUG**	**SEP-OCT**	**NOV-DEC 25**	**DEC 26-JAN**	**FEB-MAR**		**CV**
GULF ST VINCENT								
SE	1976 (3283)	2393 (2578)	3494 (3344)	4773 (2910)	10073 (7005)	3390 (5198)	26100 (10638)	40.8
METRO	6619 (13058)	4521 (3724)	6583 (4958)	9025 (8296)	17302 (14354)	7295 (8230)	51345 (23485)	45.7
NW	9255 (12628)	2342 (3759)	771 (1211)	156 (240)	1177 (1466)	1084 (1223)	14785 (13371)	90.4
SW	4038 (2848)	4405 (4742)	3623 (4460)	1635 (2000)	1693 (2136)	922 (691)	16317 (7715)	47.3
TOTAL	**21888** **(18678)**	**13661** **(7558)**	**14471** **(7558)**	**15589** **(9019)**	**30246** **(16181)**	**12691** **(9835)**	**108546** **(30050)**	**27.7**
CV	**85.3**	**55.3**	**52.2**	**57.9**	**53.5**	**77.5**		

Table 16 (cont.). Harvest (numbers) of southern calamary (*Sepioteuthis australis*)

- SE in parentheses; * seasons pooled due to low interview numbers

	SEASON						ANNUAL	
ROUTE	**APR-MAY**	**JUN-AUG**	**SEP-OCT**	**NOV-DEC 25**	**DEC 26-JAN**	**FEB-MAR**		**CV**
SPENCER GULF								
SW	3112 (3939)	2752 (5092)	2088 (2109)	1279 (1064)	1466 (1128)	1379 (1995)	12076 (7230)	59.9
CW	390 (623)	2415 (3011)	1686* (2045)*	* *	965 (1280)	1177 (1797)	6632 (4301)	64.9
NW	2461 (3070)	1324 (2434)	1628 (2862)	100 (193)	1563 (1793)	2337 (2725)	9413 (5850)	62.1
NE	617 (1049)	2319 (2461)	0 (0)	0 (0)	0 (0)	224 (602)	3161 (2742)	86.8
CE	4291 (1612)	2262 (2821)	6780 (4983)	2688 (3610)	9336 (12356)	7935 (7249)	33292 (15927)	47.8
SE	7164 (10082)	8617 (7215)	4479 (4174)	5752 (5447)	8260 (5770)	4417 (2026)	38689 (15434)	39.9
TOTAL	**18036 (11431)**	**19688 (10344)**	**16661 (7686)**	**9819 (6624)**	**21590 (13860)**	**17469 (8465)**	**103263 (24584)**	**23.8**
CV	**63.4**	**52.5**	**46.1**	**67.5**	**64.2**	**48.5**		

Table 16 (cont.). Harvest (numbers) of southern calamary (*Sepioteuthis australis*)

- SE in parentheses; * seasons pooled due to low interview numbers

	SEASON						ANNUAL	
ROUTE	**APR-MAY**	**JUN-AUG**	**SEP-OCT**	**NOV-DEC 25**	**DEC 26-JAN**	**FEB-MAR**		**CV**
WEST COAST								
CENTRAL	222	0*	*	0	214	370	806	
	(514)	(0)*	*	(0)	(156)	(287)	(609)	75.5
NORTH	2505	3386*	*	1420	2994	1139	11444	
	(1939)	(6037)*	*	(2693)	(2493)	(1025)	(7397)	64.6
TOTAL	**2727**	**3386***	*****	**1420**	**3208**	**1509**	**12250**	
	(2005)	**(6037)***	*****	**(2693)**	**(2498)**	**(1064)**	**(7422)**	**60.6**
CV	**73.5**	**178.3**		**189.7**	**77.9**	**70.5**		
STATE TOTAL	**42651**	**36735**	**31132**	**26828**	**55044**	**31669**	**224059**	
	(21990)	**(14162)**	**(10780)**	**(11510)**	**(21451)**	**(13019)**	**(39528)**	**17.6**
CV	**51.6**	**38.6**	**34.6**	**42.9**	**39.0**	**41.1**		

Table 17. Comparison of the recreational and commercial harvest (tonnes) of southern calamary (*Sepioteuthis australis*) by MSF Block

- Gulf St Vincent (April 1994 to March 1995), Spencer Gulf and West Coast (April 1995 to March 1996)
- [1] these totals do not correspond to the totals in Table 16 as Block 27 in West Coast was surveyed within a Spencer Gulf Route (SW) (see Fig. 3) - the sum of the two equals those in Table 16

BLOCKS	RECREATIONAL (R)		COMMERCIAL (C)	ALLOCATION
	Nos	tonnes	tonnes	R:R+C
34, 35, 40	30942	12.9	81.5	13.7
36, 43	67497	24.9	43.1	36.6
44, 45	10013	4.6	49.7	8.5
GULF ST VINCENT	**108452[1]**	**42.4**	**174.3**	**19.6**
19, 20, 21, 22	13186	4.4	22.4	16.4
23	16771	6.0	46.0	11.5
29, 30	8279	3.1	15.5	16.7
31	9799	3.0	20.5	12.8
32	16870	6.4	35.7	15.2
33	38252	14.0	21.1	39.9
SPENCER GULF	**103157[2]**	**36.9**	**161.2**	**18.6**
All	12356	3.5	18.1	16.2
WEST COAST	**12356[2]**	**3.5**	**18.1**	**16.2**
STATE	**223965[1]**	**82.8**	**353.6**	**19.0**

Table 18. Recreational harvest (numbers) of blue swimmer crab (*Portunus pelagicus*)

- SE in parentheses

			SEASON				ANNUAL	
ROUTE	**APR-MAY**	**JUN-AUG**	**SEP-OCT**	**NOV-DEC 25**	**DEC 26-JAN**	**FEB-MAR**		**CV**
GULF ST VINCENT								
SE	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	
METRO	22533 (29841)	10056 (21642)	30910 (24719)	21122 (39431)	70948 (49541)	216272 (162952)	371841 (180367)	48.5
NW	8110 (12753)	781 (1366)	814 (1488)	938 (1141)	14675 (18298)	26069 (33314)	51386 (40158)	78.2
SW	0 (0)	0 (0)	362 (964)	0 (0)	382 (1114)	49 (128)	793 (1478)	186.4
TOTAL	**30643**	**10837**	**32086**	**22060**	**86005**	**242389**	**424020**	
	(32452)	**(21685)**	**(24783)**	**(39448)**	**(52824)**	**(166322)**	**(184789)**	**43.6**
CV	**105.9**	**200.1**	**77.2**	**178.8**	**61.4**	**68.6**		

Table 18 (cont). Blue swimmer crab harvest

- SE in parentheses

	SEASON						ANNUAL	
ROUTE	**APR-MAY**	**JUN-AUG**	**SEP-OCT**	**NOV-DEC 25**	**DEC 26-JAN**	**FEB-MAR**		**CV**
SPENCER GULF								
SW	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.0
CW	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	41 (128)	41 (128)	316.1
NW	7478 (9533)	80 (150)	3492 (2676)	7200 (4799)	12633 (10917)	31467 (14586)	62350 (21285)	34.1
NE	4770 (7109)	0 (0)	1488 (3196)	6859 (0)	13826 (15009)	38500 (27645)	65442 (32408)	49.5
CE	1918 (2770)	0 (0)	2437 (2651)	493 (963)	8363 (11548)	20414 (11417)	33625 (16713)	49.7
SE	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.0
TOTAL	**14166 (12210)**	**80 (150)**	**7417 (4940)**	**14551 (4895)**	**34821 (21859)**	**90422 (33277)**	**161458 (42221)**	**26.2**
CV	**86.2**	**187.4**	**66.6**	**33.6**	**62.8**	**36.8**		

Table 18 (cont). Blue swimmer crab harvest

- SE in parentheses; * seasons pooled due to low interview numbers

	SEASON						ANNUAL	
ROUTE	**APR-MAY**	**JUN-AUG**	**SEP-OCT**	**NOV-DEC 25**	**DEC 26-JAN**	**FEB-MAR**		**CV**
WEST COAST								
CENTRAL	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.0
NORTH	0 (0)	282* (694)*	* *	0 (0)	4539 (8871)	134 (210)	4956 (8901)	179.6
TOTAL	**0** **(0)**	**282*** **(694)***	***** *****	**0** **(0)**	**4539** **(8871)**	**134** **(210)**	**4956** **(8901)**	**179.6**
		245.9			**195.4**	**156.5**		
STATE TOTAL	**44809** **(34673)**	**11199** **(21697)**	**39503** **(25271)**	**36611** **(39751)**	**125365** **(57852)**	**332945** **(169618)**	**590434** **(189760)**	**32.1**
CV	**77.4**	**193.7**	**64.0**	**108.6**	**46.1**	**50.9**		

Table 19. Comparison of the recreational and commercial harvest (tonnes) of blue swimmer crab (*Portunus pelagicus*) by MSF Block

- Gulf St Vincent (April 1994 to March 1995), Spencer Gulf and West Coast (April 1995 to March 1996)

BLOCKS	RECREATIONAL (R)		COMMERCIAL (C)	ALLOCATION
	Nos	tonnes	tonnes	R:R+C
34	22240	7.1	7.5	48.6
35	28106	7.2	124.0	5.5
36/43	373674	101.6	105.1	49.2
GULF ST VINCENT	**424020**	**115.8**	**236.6**	**32.9**
9	4956	1.5		
11	25300	7.7		
20	27193	7.4		
21	70089	16.9	373.3	10.8
22	6569	2.0		
23	25417	7.4		
32/33	6890	2.5		
SPENCER GULF & WEST COAST	**166414**	**45.4**	**373.3**	**10.8**
STATE	**590434**	**161.2**	**609.9**	**20.9**

Table 20. Recreational harvest (numbers) of Australian herring (*Arripis georgiana*)

- SE in parentheses

			SEASON				ANNUAL	
ROUTE	**APR-MAY**	**JUN-AUG**	**SEP-OCT**	**NOV-DEC 25**	**DEC 26-JAN**	**FEB-MAR**		**CV**
GULF ST VINCENT								
SE	3760 (2905)	94 (193)	1876 (1977)	6218 (4898)	8875 (7122)	2999 (2305)	23823 (9613)	40.4
METRO	5548 (9645)	646 (1201)	3270 (3193)	18832 (10057)	55135 (35711)	17980 (8976)	101411 (39517)	39.0
NW	8797 (18411)	0 (0)	3983 (7572)	2501 (3594)	16950 (19571)	15591 (9107)	47823 (29583)	61.9
SW	21036 (27888)	2746 (2450)	4951 (4223)	8925 (8513)	9614 (6894)	4661 (5701)	51933 (30888)	59.5
TOTAL	**39142** **(34902)**	**3486** **(2735)**	**14081** **(9448)**	**36476** **(14509)**	**90575** **(41911)**	**41231** **(14189)**	**224990** **(59019)**	**26.2**
CV	**89.2**	**78.4**	**67.1**	**39.8**	**46.3**	**34.4**		

Table 20 (cont). Australian herring harvest

- SE in parentheses; * seasons pooled due to low interview numbers

	SEASON						ANNUAL	
ROUTE	**APR-MAY**	**JUN-AUG**	**SEP-OCT**	**NOV-DEC 25**	**DEC 26-JAN**	**FEB-MAR**		**CV**
SPENCER GULF								
SW	4491 (6471)	540 (1444)	1408 (2111)	2878 (2313)	13027 (8659)	11954 (15251)	34297 (19009)	55.4
CW	56 (154)	0 (0)	874* (2179)*	* *	3426 (4022)	2150 (1865)	6507 (4943)	76.0
NW	4764 (5236)	0 (0)	613 (665)	796 (498)	2239 (2609)	2303 (2580)	10717 (6448)	60.2
NE	1459 (1640)	89 (134)	661 (775)	245 (0)	47 (126)	561 (497)	3063 (1889)	61.7
CE	5049 (11464)	1798 (3072)	2216 (2023)	2150 (3070)	25663 (26020)	6443 (7051)	43318 (29684)	68.5
SE	5518 (5287)	319 (294)	6897 (15540)	2827 (2856)	6708 (7660)	4201 (4388)	26471 (18857)	71.2
TOTAL	**21336** **(15211)**	**2746** **(3410)**	**12670** **(15994)**	**8897** **(4814)**	**51111** **(28873)**	**27613** **(17662)**	**124374** **(40836)**	**32.8**
CV	**71.3**	**124.2**	**126.2**	**54.1**	**56.5**	**64.0**		

Table 20 (cont). Australian herring harvest

- SE in parentheses; * seasons pooled due to low interview numbers

			SEASON				ANNUAL	
ROUTE	**APR-MAY**	**JUN-AUG**	**SEP-OCT**	**NOV-DEC 25**	**DEC 26-JAN**	**FEB-MAR**		**CV**
WEST COAST								
CENTRAL	2833	1589*	*	1171	3711	2517	11821	
	(1305)	(2598)*	*	(1889)	(3143)	(1007)	(4787)	40.5
NORTH	2241	3668*	*	5006	3767	2748	17429	
	(1560)	(5157)*	*	(3125)	(2782)	(1432)	(6970)	40.0
TOTAL	**5074**	**5257***	*****	**6177**	**7478**	**5265**	**29251**	
	(2034)	**(5774)***	*****	**(3652)**	**(4197)**	**(1750)**	**(8455)**	**28.9**
	40.1	**109.8**		**59.1**	**56.1**	**33.2**		
STATE TOTAL	**65552**	**11489**	**26751**	**51550**	**149164**	**74109**	**378615**	
	(38127)	**(7242)**	**(18576)**	**(15717)**	**(51067)**	**(22723)**	**(72266)**	**19.1**
CV	**58.2**	**63.0**	**69.4**	**30.5**	**34.2**	**30.7**		

Table 21. Comparison of the recreational and commercial harvest (tonnes) of Australian herring (*Arripis georgiana*) by MSF Block

- Gulf St Vincent (April 1994 to March 1995), Spencer Gulf and West Coast (April 1995 to March 1996)
- [1] these totals do not correspond to the totals in Table 20 as Block 27 in West Coast was surveyed within a Spencer Gulf Route (SW) (see Fig. 3) - the sum of the two equals those in Table 20

BLOCKS	RECREATIONAL (R)		COMMERCIAL (C)	ALLOCATION
	Nos	tonnes	tonnes	R:R+C
34	44434	5.2	13.8	27.4
35	19532	2.0	35.6	5.3
36	97260	7.7	24.4	24.0
43	18763	1.5	0	100
40	36823	3.5	6.4	39.6
44, 45	8177	0.7		
GULF ST VINCENT	**224989**	**20.6**	**80.2**	**20.4**
19, 20, 22	8747	1.0	26.4	3.6
11, 21	5060	0.4	28.1	1.4
23	39168	3.7	44.3	7.7
29, 32	9336	1.2	23.2	4.9
30, 31	19228	1.6	13.6	10.5
33	26315	2.1	16.2	11.5
SPENCER GULF	**107854[1]**	**10.0**	**151.8**	**6.2**
8, 9, 10	17429	2.3	1.1	67.6
15, 16, 17	11821	1.3	1.0	56.5
27	16521	1.4	3.5	28.6
WEST COAST	**45771[1]**	**5.0**	**5.6**	**47.2**
STATE	**378614**	**35.6**	**237.6**	**13.0**

Table 22. Recreational harvest (numbers) of snook (*Sphyraena novaehollandiae*)

- SE in parentheses

	SEASON						ANNUAL	
ROUTE	**APR-MAY**	**JUN-AUG**	**SEP-OCT**	**NOV-DEC 25**	**DEC 26-JAN**	**FEB-MAR**		**CV**
GULF ST VINCENT								
SE	868 (1490)	0 (0)	1747 (4163)	806 (1846)	436 (664)	0 (0)	3857 (4838)	125.4
METRO	243 (358)	0 (0)	1045 (3345)	701 (1177)	5050 (11275)	1696 (4089)	8736 (12512)	143.2
NW	2428 (5630)	3458 (6050)	257 (728)	260 (306)	314 (811)	3311 (7686)	10028 (11343)	113.1
SW	2941 (5288)	114 (309)	61 (166)	252 (393)	1311 (1297)	145 (354)	4824 (5481)	113.6
TOTAL	**6481 (7874)**	**3572 (6058)**	**3109 (5392)**	**2019 (2246)**	**7112 (11398)**	**5152 (8713)**	**27445 (18403)**	**67.1**
CV	**121.5**	**169.6**	**173.5**	**111.2**	**160.3**	**169.1**		

Table 22 (cont). Snook harvest

- SE in parentheses; * seasons pooled due to low interview numbers

	SEASON						ANNUAL	
ROUTE	**APR-MAY**	**JUN-AUG**	**SEP-OCT**	**NOV-DEC 25**	**DEC 26-JAN**	**FEB-MAR**		**CV**
SPENCER GULF								
SW	133 (338)	0 (0)	0 (0)	137 (378)	163 (315)	1992 (4977)	2426 (5013)	206.7
CW	1615 (2283)	51 (56)	2311* (6340)*	* *	2606 (4305)	3327 (2166)	9910 (8285)	83.6
NW	1578 (2842)	0 (0)	71 (144)	2820 (4103)	592 (629)	1219 (2943)	6279 (5830)	92.8
NE	0 (0)	45 (120)	0 (0)	0 (0)	142 (306)	224 (313)	411 (454)	110.6
CE	3029 (5394)	2842 (6287)	3368 (3341)	2464 (1919)	1593 (2557)	1696 (3804)	14991 (10221)	68.2
SE	5712 (9694)	160 (348)	3135 (7307)	2145 (3123)	350 (874)	1400 (1191)	12902 (12627)	97.9
TOTAL	**12066** **(11682)**	**3098** **(6298)**	**8885** **(10236)**	**7566** **(5515)**	**5445** **(5140)**	**9859** **(7356)**	**46919** **(19796)**	**42.2**
CV	**96.8**	**203.3**	**115.2**	**72.9**	**94.4**	**74.6**		

Table 22 (cont). Snook harvest

- SE in parentheses; * seasons pooled due to low interview numbers

			SEASON				ANNUAL	
ROUTE	**APR-MAY**	**JUN-AUG**	**SEP-OCT**	**NOV-DEC 25**	**DEC 26-JAN**	**FEB-MAR**		**CV**
WEST COAST								
CENTRAL	111	0*	*	84	0	0	195	
	(178)	(0)*	*	(123)	(0)	(0)	(216)	111.1
NORTH	3428	282*	*	747	483	2144	7084	
	(4194)	(694)*	*	(1187)	(613)	(3363)	(5583)	78.8
TOTAL	**3539**	**282***	*****	**831**	**483**	**2144**	**7279**	
	(4198)	**(694)***	*****	**(1193)**	**(613)**	**(3363)**	**(5587)**	**76.8**
	118.6	**245.9**		**143.6**	**127.0**	**156.8**		
STATE TOTAL	**22086**	**6952**	**11994**	**10416**	**13040**	**17155**	**81643**	
	(14700)	**(8766)**	**(11569)**	**(6073)**	**(12518)**	**(11889)**	**(27600)**	**33.8**
CV	**66.6**	**126.1**	**96.5**	**58.3**	**96.0**	**69.3**		

Table 23. Comparison of the recreational and commercial harvest (tonnes) of snook (*Sphyraena novaehollandiae*) by MSF Block

- Gulf St Vincent (April 1994 to March 1995), Spencer Gulf and West Coast (April 1995 to March 1996)
- [1] these totals do not correspond to the totals in Table 22 as Block 27 in West Coast was surveyed within a Spencer Gulf Route (SW) (see Fig. 3) - the sum of the two equals those in Table 22

BLOCKS	RECREATIONAL (R)		COMMERCIAL (C)	ALLOCATION
	Nos	tonnes	tonnes	R:R+C
35	4689	2.1	37.4	5.3
34, 36	15256	8.3	11.6	41.7
40, 44, 45	7500	6.8	8.0	45.9
GULF ST VINCENT	**27445**	**17.2**	**57.0**	**23.2**
19, 20	3990	2.8	5.8	32.6
11, 21, 22, 23	10915	6.2	41.3	13.1
29, 30, 31	7679	4.5	7.9	36.3
32	9690	6.2	5.3	53.9
33	12575	7.7	8.3	48.1
SPENCER GULF	**44849[1]**	**27.4**	**68.6**	**28.5**
ALL	9348	5.2	18.2	22.2
WEST COAST	**9348[1]**	**5.2**	**18.2**	**22.2**
STATE	**81642**	**49.8**	**143.8**	**25.7**

Table 24. Recreational harvest (numbers) of Australian salmon (*Arripis truttacea*)

- SE in parentheses

	SEASON						ANNUAL	
ROUTE	**APR-MAY**	**JUN-AUG**	**SEP-OCT**	**NOV-DEC 25**	**DEC 26-JAN**	**FEB-MAR**		**CV**
GULF ST VINCENT								
SE	1591 (2458)	376 (446)	6595 (13128)	228 (510)	821 (1213)	0 (0)	9610 (13428)	139.7
METRO	2920 (5282)	0 (0)	333 (647)	2127 (4031)	449 (760)	245 (616)	6075 (6747)	111.1
NW	4078 (6276)	1562 (1627)	1582 (2768)	676 (777)	785 (1443)	424 (1029)	9108 (7311)	80.3
SW	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	
TOTAL	**8589 (8564)**	**1938 (1687)**	**8511 (13432)**	**3031 (4137)**	**2055 (2033)**	**669 (1199)**	**24793 (16712)**	**67.4**
CV	**99.7**	**87.0**	**157.8**	**136.5**	**98.9**	**179.2**		

Table 24 (cont). Australian salmon harvest

- SE in parentheses; * seasons pooled due to low interview numbers

	SEASON						ANNUAL	
ROUTE	**APR-MAY**	**JUN-AUG**	**SEP-OCT**	**NOV-DEC 25**	**DEC 26-JAN**	**FEB-MAR**		**CV**
SPENCER GULF								
SW	1378 (1756)	971 (1979)	1942 (3067)	3426 (4335)	977 (1012)	3601 (5226)	12296 (7971)	64.8
CW	223 (588)	0 (0)	125* (421)*	* *	145 (368)	0 (0)	492 (812)	164.9
NW	599 (856)	0 (0)	94 (127)	763 (2420)	42 (124)	440 (1153)	1940 (2820)	145.4
NE	168 (370)	0 (0)	165 (399)	0 (0)	0 (0)	337 (868)	670 (1025)	152.8
CE	808 (1739)	0 (0)	443 (610)	90 (260)	0 (0)	271 (594)	1612 (1953)	121.2
SE	0 (0)	0 (0)	0 (0)	0 (0)	300 (775)	0 (0)	300 (775)	258.0
TOTAL	**3177 (2706)**	**971 (1979)**	**2770 (3183)**	**4279 (4972)**	**1464 (1333)**	**4650 (5454)**	**17311 (8810)**	**50.9**
CV	**85.2**	**203.7**	**114.9**	**116.2**	**91.0**	**117.3**		

Table 24 (cont). Australian salmon harvest

- SE in parentheses; * seasons pooled due to low interview numbers

			SEASON				ANNUAL	
ROUTE	**APR-MAY**	**JUN-AUG**	**SEP-OCT**	**NOV-DEC 25**	**DEC 26-JAN**	**FEB-MAR**		**CV**
WEST COAST								
CENTRAL	1000	151*	*	167	0	1110	2429	
	(1076)	(55)*	*	(345)	(0)	(650)	(1305)	53.7
NORTH	66	56*	*	149	193	335	800	
	(148)	(139)*	*	(190)	(196)	(575)	(668)	83.5
TOTAL	**1066**	**208***	*****	**317**	**193**	**1445**	**3229**	
	(1086)	**(149)***	*****	**(394)**	**(196)**	**(867)**	**(1466)**	**45.4**
	101.9	**71.8**		**124.5**	**101.5**	**60.0**		
STATE TOTAL	**12832**	**3117**	**11281**	**7627**	**3712**	**6764**	**45333**	
	(9047)	**(2605)**	**(13804)**	**(6480)**	**(2439)**	**(5651)**	**(18949)**	**41.8**
CV	**70.5**	**83.6**	**122.4**	**85.0**	**65.7**	**83.5**		

Table 25. Comparison of the recreational and commercial harvest (tonnes) of Australian salmon (*Arripis truttacea*) by MSF Block

- Gulf St Vincent (April 1994 to March 1995), Spencer Gulf and West Coast (April 1995 to March 1996)
- [1] these totals do not correspond to the totals in Table 24 as Block 27 in West Coast was surveyed within a Spencer Gulf Route (SW) (see Fig. 3) - the sum of the two equals those in Table 24

BLOCKS	RECREATIONAL (R)		COMMERCIAL (C)	ALLOCATION
	Nos	tonnes	tonnes	R:R+C
35	7983	3.6	37.3	15.4
34, 36	7882	3.2		
40	0	0	148.4	3.4
43, 44, 45	8928	5.2		
GULF ST VINCENT	**24793**	**12.0**	**185.7**	**6.5**
SPENCER GULF	5290	2.4		
8 - 17	3229	1.6	158.0	4.2
27	12021	2.9		
SPENCER GULF & WEST COAST	**20540**	**6.9**	**158.0**	**4.2**
STATE	**45333**	**16.9**	**343.7**	**4.7**

Table 26. Recreational harvest (numbers) of snapper (*Pagrus auratus*)

- SE in parentheses

	SEASON						ANNUAL	
ROUTE	**APR-MAY**	**JUN-AUG**	**SEP-OCT**	**NOV-DEC 25**	**DEC 26-JAN**	**FEB-MAR**		**CV**
GULF ST VINCENT								
SE	289 (473)	0 (0)	0 (0)	0 (0)	272 (745)	65 (159)	627 (897)	143.1
METRO	195 (610)	0 (0)	0 (0)	117 (368)	662 (1291)	0 (0)	974 (1474)	151.4
NW	92 (246)	0 (0)	0 (0)	0 (0)	549 (771)	0 (0)	641 (809)	126.3
SW	50 (166)	343 (861)	0 (0)	0 (0)	0 (0)	437 (685)	830 (1113)	134.1
TOTAL	**625** **(827)**	**343** **(861)**	**0** **(0)**	**117** **(368)**	**1484** **(1678)**	**502** **(704)**	**3072** **(2207)**	**71.9**
CV	**132.2**	**251.0**		**315.1**	**113.1**	**140.1**		

Table 26 (cont). Snapper harvest

- SE in parentheses; * seasons pooled due to low interview numbers

	SEASON						ANNUAL	
ROUTE	**APR-MAY**	**JUN-AUG**	**SEP-OCT**	**NOV-DEC 25**	**DEC 26-JAN**	**FEB-MAR**		**CV**
SPENCER GULF								
SW	0 (0)	0 (0)	0 (0)	640 (708)	163 (197)	0 (0)	802 (735)	91.6
CW	2283 (4117)	0 (0)	749* (2432)*	* *	241 (463)	1339 (2947)	4612 (5636)	122.2
NW	947 (2249)	361 (985)	24 (70)	100 (144)	1563 (1958)	1016 (826)	4010 (3251)	81.1
NE	1178 (2582)	580 (684)	0 (0)	0 (0)	236 (543)	112 (289)	2106 (2741)	130.1
CE	202 (515)	1682 (2570)	886 (2098)	762 (1278)	3097 (4957)	610 (1584)	7239 (6324)	87.4
SE	871 (1623)	160 (371)	90 (196)	0 (0)	150 (374)	431 (1361)	1701 (2191)	128.8
TOTAL	**5481** **(5619)**	**2782** **(2860)**	**1749** **(3219)**	**1501** **(1468)**	**5451** **(5394)**	**3509** **(3716)**	**20472** **(9756)**	**47.7**
CV	**102.5**	**102.8**	**184.0**	**97.9**	**99.0**	**105.9**		
STATE TOTAL	**6106** **(5680)**	**3125** **(2987)**	**1749** **(3219)**	**1618** **(1513)**	**6935** **(5649)**	**4011** **(3782)**	**23544** **(10003)**	**42.5**
CV	**93.0**	**95.6**	**184.0**	**93.5**	**81.5**	**94.3**		

Table 27. Comparison of the recreational and commercial harvest (tonnes) of snapper (*Pagrus auratus*) by MSF Block

- Gulf St Vincent (April 1994 to March 1995), Spencer Gulf and West Coast (April 1995 to March 1996)

BLOCKS	RECREATIONAL (R)		COMMERCIAL (C)	ALLOCATION
	Nos	tonnes	tonnes	R:R+C
35, 36	1615	8.3	16.9	32.9
40, 43, 44, 45	1457	2.5	12.5	16.7
GULF ST VINCENT	**3072**	**10.8**	**29.4**	**26.9**
11, 21	5934	12.7	109.8	10.4
19, 20, 22, 23	5721	14.6	97.2	13.1
29	4562	3.9	2.2	63.9
30, 31, 32	1652	1.3	18.2	6.7
33	2503	3.7	18.2	16.9
SPENCER GULF	**20372**	**36.2**	**245.6**	**12.8**
WEST COAST	**100**	**1.0**	**7.0**	**12.5**
STATE	**23544**	**48.0**	**282.0**	**14.5**

Table 28. Recreational harvest (numbers) of blue mackerel (*Scomber australasicus*)

- SE in parentheses

	SEASON						ANNUAL	
ROUTE	**APR-MAY**	**JUN-AUG**	**SEP-OCT**	**NOV-DEC 25**	**DEC 26-JAN**	**FEB-MAR**		**CV**
GULF ST VINCENT								
SE	1350 (2398)	0 (0)	0 (0)	1885 (1711)	10563 (11657)	4101 (0)	17899 (12023)	67.2
METRO	3747 (9383)	1087 (3234)	556 (1930)	4150 (5764)	11148 (9845)	13839 (19109)	34528 (24444)	70.8
NW	0 (0)	0 (0)	255 (676)	0 (0)	624 (1436)	0 (0)	879 (1587)	180.6
SW	0 (0)	0 (0)	0 (0)	128 (321)	0 (0)	98 (224)	226 (392)	173.1
TOTAL	**5097 (9684)**	**1087 (3234)**	**811 (2045)**	**6163 (6021)**	**22336 (15325)**	**18038 (19110)**	**53532 (27290)**	**51.0**
CV	**190.0**	**297.5**	**252.3**	**97.7**	**68.6**	**105.9**		

Table 28 (cont). Blue mackerel harvest

- SE in parentheses; * seasons pooled due to low interview numbers

	SEASON						ANNUAL	
ROUTE	**APR-MAY**	**JUN-AUG**	**SEP-OCT**	**NOV-DEC 25**	**DEC 26-JAN**	**FEB-MAR**		**CV**
SPENCER GULF								
SW	133 (442)	0 (0)	0 (0)	0 (0)	0 (0)	996 (2052)	1130 (2099)	185.8
CW	0 (0)	0 (0)	0* (0)*	* *	97 (232)	1542 (4564)	1638 (4570)	278.9
NW	32 (97)	0 (0)	0 (0)	265 (514)	296 (547)	542 (891)	1135 (1169)	103.0
NE	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.0
CE	1515 (5200)	0 (0)	266 (538)	0 (0)	3009 (7716)	1899 (3546)	6688 (9972)	149.1
SE	387 (940)	0 (0)	0 (0)	97 (263)	300 (795)	323 (318)	1108 (1298)	117.2
TOTAL	**2067** **(5303)**	**0** **(0)**	**266** **(538)**	**363** **(577)**	**3701** **(7779)**	**5302** **(6206)**	**11699** **(11304)**	**96.6**
CV	**256.6**	**0.0**	**202.3**	**159.1**	**210.2**	**117.0**		

Table 28 (cont). Blue mackerel harvest

- SE in parentheses; * seasons pooled due to low interview numbers

			SEASON				ANNUAL	
ROUTE	**APR-MAY**	**JUN-AUG**	**SEP-OCT**	**NOV-DEC 25**	**DEC 26-JAN**	**FEB-MAR**		**CV**
WEST COAST								
CENTRAL	0 (0)	0* (0)*	* *	0 (0)	0 (0)	0 (0)	0 (0)	0.0
NORTH	0 (0)	0* (0)*	* *	0 (0)	0 (0)	3217 (6337)	3217 (6337)	197.0
TOTAL	**0** **(0)**	**0*** **(0)***	*** ***	**0** **(0)**	**0** **(0)**	**3217** **(6337)** **197.0**	**3217** **(6337)**	**197.0**
STATE TOTAL	**7164** **(11041)**	**1087** **(3234)**	**1077** **(2115)**	**6526** **(6049)**	**26037** **(17186)**	**26557** **(21068)**	**68448** **(30211)**	**44.1**
CV	**154.1**	**297.5**	**196.3**	**92.7**	**66.0**	**79.3**		

Table 29. Comparison of the recreational and commercial harvest (tonnes) of blue mackerel (*Scomber australasicus*) by MSF Block

- Gulf St Vincent (April 1994 to March 1995), Spencer Gulf and West Coast (April 1995 to March 1996)

BLOCKS	RECREATIONAL (R)		COMMERCIAL (C)	ALLOCATION
	Nos	tonnes	tonnes	R:R+C
34, 35, 36	33135	7.3		
40, 43	15785	3.5	5.2	70.3
44, 45	4612	1.5		
GULF ST VINCENT	**53532**	**12.3**	**5.2**	**70.3**
ALL	14916	3.2	<0.1	100
SPENCER GULF & WEST COAST	**14916**	**3.2**	**<0.1**	**100**
STATE	**68448**	**15.5**	**5.2**	**74.9**

Table 30. Recreational harvest (numbers) of "all fish"

- SE in parentheses

	SEASON						ANNUAL	
ROUTE	**APR-MAY**	**JUN-AUG**	**SEP-OCT**	**NOV-DEC 25**	**DEC 26-JAN**	**FEB-MAR**		**CV**
GULF ST VINCENT								
SE	47047 (27104)	6898 (3071)	35982 (29431)	44665 (22630)	69429 (30757)	41142 (19252)	245163 (58643)	23.9
METRO	154568 (80111)	98245 (84383)	112447 (45271)	140506 (76669)	360256 (174903)	346782 (171780)	1212804 (285596)	23.5
NW	53838 (30039)	34455 (26442)	21757 (14616)	10838 (6684)	76124 (35839)	88985 (35192)	285997 (66202)	23.1
SW	84594 57459)	45140 (23829)	21828 (10850)	29286 (16788)	46265 (27634)	23886 (11192)	250998 (71818)	28.6
TOTAL	**340046 (106566)**	**184739 (91635)**	**192014 (56983)**	**225295 (81956)**	**552075 (183262)**	**500794 (176756)**	**1994962 (307481)**	**15.4**
CV	**31.3**	**49.6**	**29.7**	**36.4**	**33.2**	**35.3**		

Table 30 (cont). "All fish" harvest

- SE in parentheses; * seasons pooled due to low interview numbers

	SEASON						ANNUAL	
ROUTE	**APR-MAY**	**JUN-AUG**	**SEP-OCT**	**NOV-DEC 25**	**DEC 26-JAN**	**FEB-MAR**		**CV**
SPENCER GULF								
SW	82880	24067	11410	15989	43723	78771	256839	
	(36418)	(14870)	(6573)	(5058)	(13791)	(40756)	(58885)	22.9
CW	15255	11045	22047*	*	24902	28646	101895	
	(8726)	(5408)	(18864)*	*	(19435)	(18319)	(34272)	33.6
NW	49316	19938	15006	26	40138	66322	190745	
	(14901)	(12803)	(7659)	(11268)	(20247)	(30729)	(43884)	23.0
NE	64700	29031	20669	12248	23452	58030	208130	
	(53033)	(18369)	(13392)	(5496)	(27742)	(27625)	(69945)	33.6
CE	48517	83292	46971	38121	128492	128047	473439	
	(25323)	(43442)	(22787)	(29873)	(44338)	(55713)	(94921)	20.0
SE	35916	31595	37980	37635	73539	78637	295303	
	(24344)	(17683)	(26082)	(15432)	(27796)	(28395)	(58332)	19.8
TOTAL	**296583**	**198968**	**154083**	**104018**	**334246**	**438453**	**1526350**	
	(75305)	**(54328)**	**(42855)**	**(36240)**	**(66978)**	**(87260)**	**(154508)**	**10.1**
CV	**25.4**	**27.3**	**27.8**	**34.8**	**20.0**	**19.9**		

Table 30 (cont). "All fish" harvest

- SE in parentheses; * seasons pooled due to low interview numbers

			SEASON				ANNUAL	
ROUTE	**APR-MAY**	**JUN-AUG**	**SEP-OCT**	**NOV-DEC 25**	**DEC 26-JAN**	**FEB-MAR**		**CV**
WEST COAST								
CENTRAL	14944 (5430)	11881* (10837)*	* *	13213 (9743)	12561 (8132)	20062 (5498)	72661 (18390)	25.3
NORTH	31179 (17171)	17267* (10059)*	* *	29064 (17133)	54474 (13978)	44296 (16287)	176281 (33915)	19.2
TOTAL	**46123** **(18009)**	**29149*** **(14786)***	*** ***	**42278** **(19709)**	**67034** **(16171)**	**64358** **(17189)**	**248941** **(38580)**	**15.5**
CV	**39.0**	**50.7**		**46.6**	**24.1**	**26.7**		
STATE TOTAL	**682752** **(131725)**	**412856** **(107551)**	**346097** **(71299)**	**371591** **(91753)**	**953355** **(195787)**	**1003605** **(197870)**	**3770256** **(346274)**	**9.2**
	19.3	**26.1**	**20.6**	**24.7**	**20.5**	**19.7**		

Fig. 1. Map of South Australia showing the three study regions

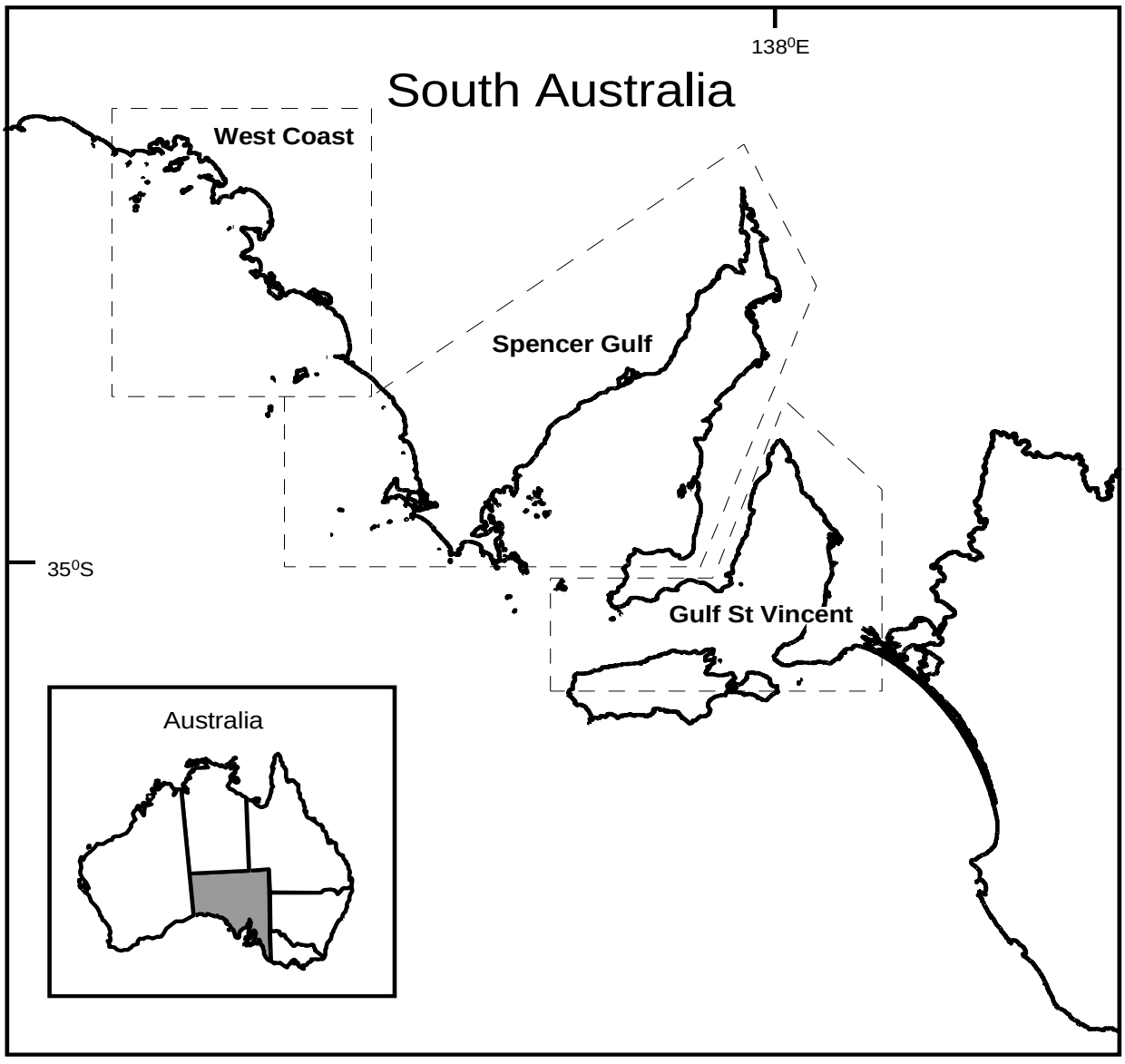


Fig. 2. Gulf St Vincent study region

- dotted lines encompass survey Routes; access site numbers are next to coastline and relate to access sites in Table 1; circled numbers indicate MSF Block numbers

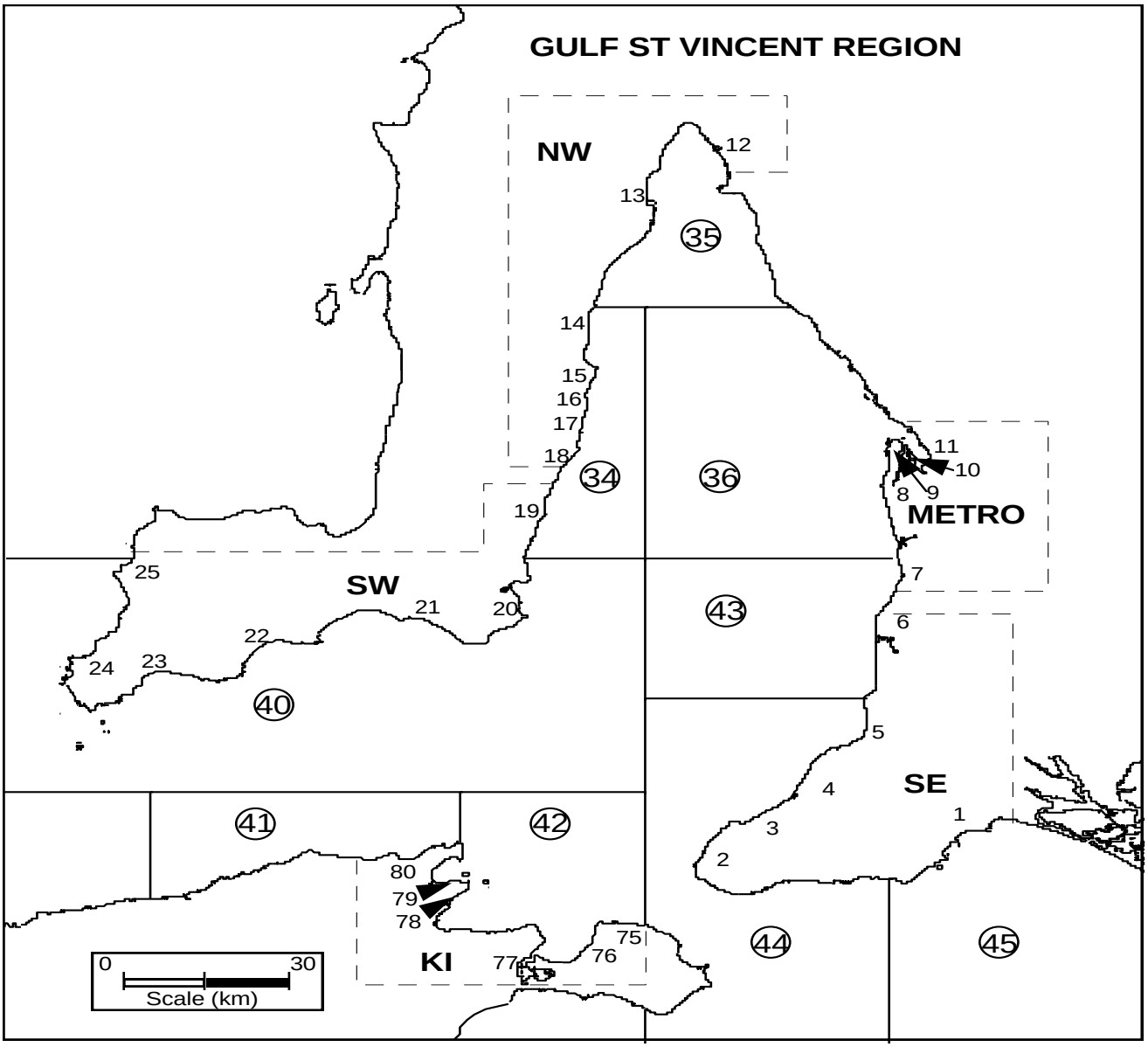


Fig. 3. Spencer Gulf study region

- dotted lines encompass survey Routes; access site numbers are next to coastline and relate to access sites in Table 1; circled numbers indicate MSF Block numbers

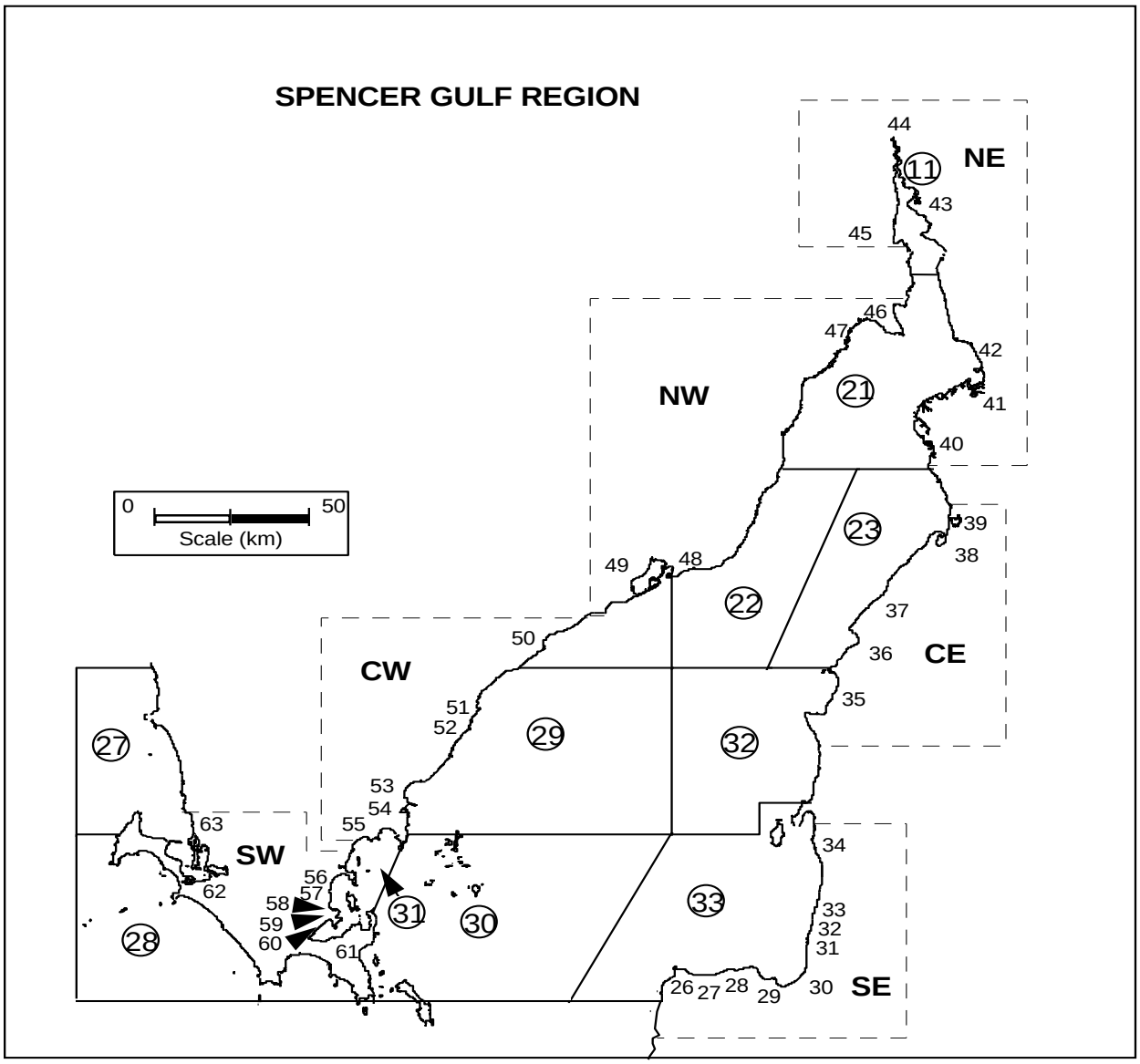


Fig. 4. West Coast study region

- dotted lines encompass survey Routes; access site numbers are next to coastline and relate to access sites in Table 1; circled numbers indicate MSF Block numbers

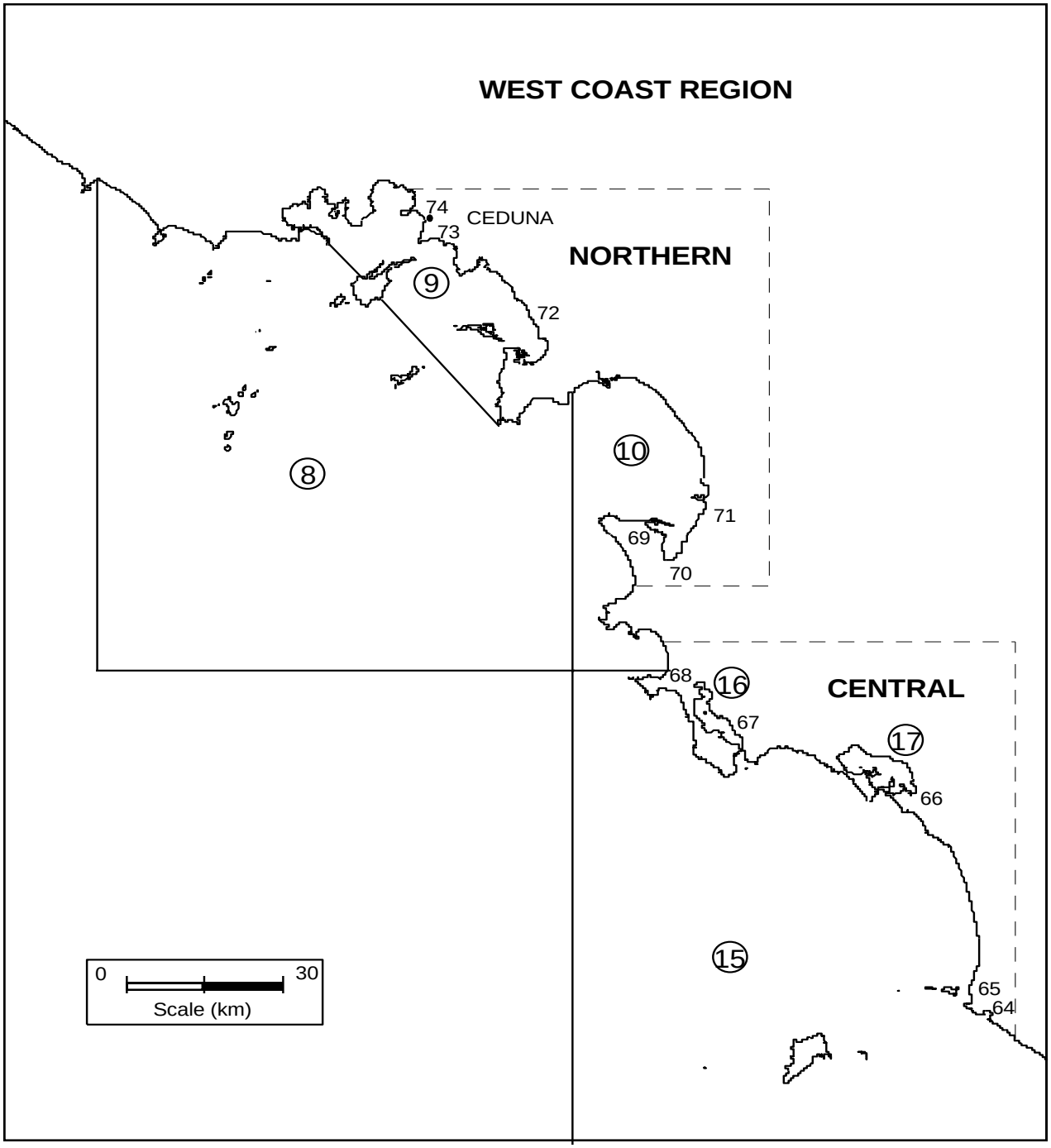


Fig. 5. Daily recreational fishing effort (boathours)

- Gulf St Vincent (April 1994 - March 1995), Spencer Gulf and West Coast waters (April 1995 - March 1996). Data are means (and standard errors) for all Routes combined within each region.

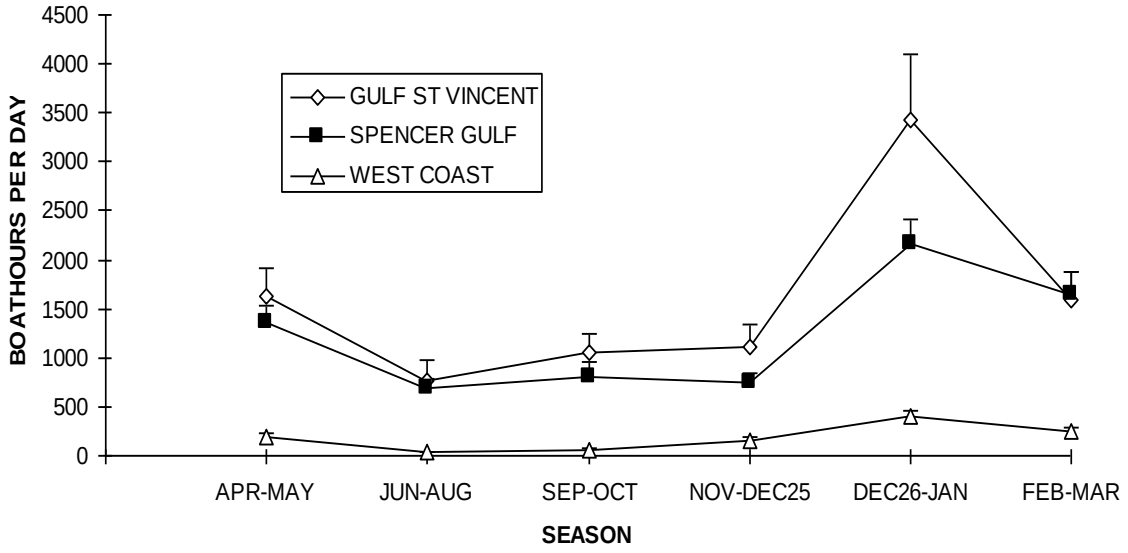
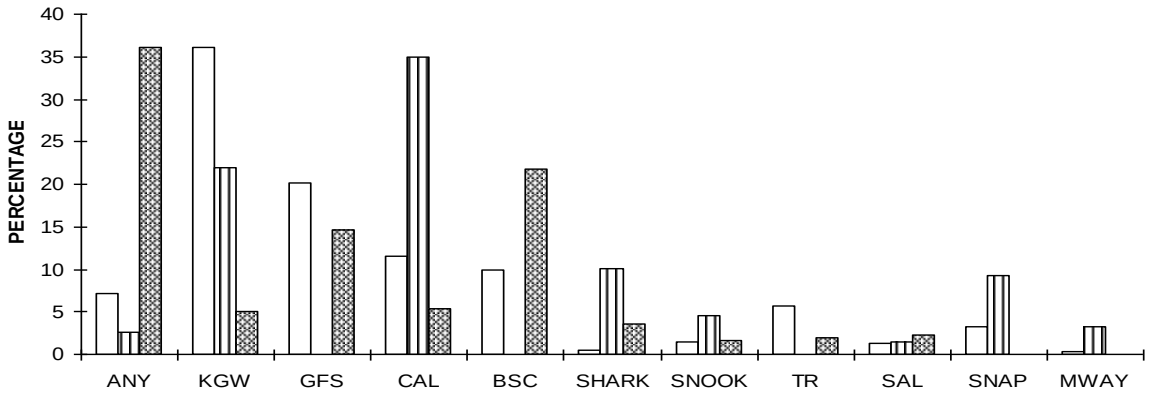


Fig. 6. Comparison of commercial and recreational targeted effort

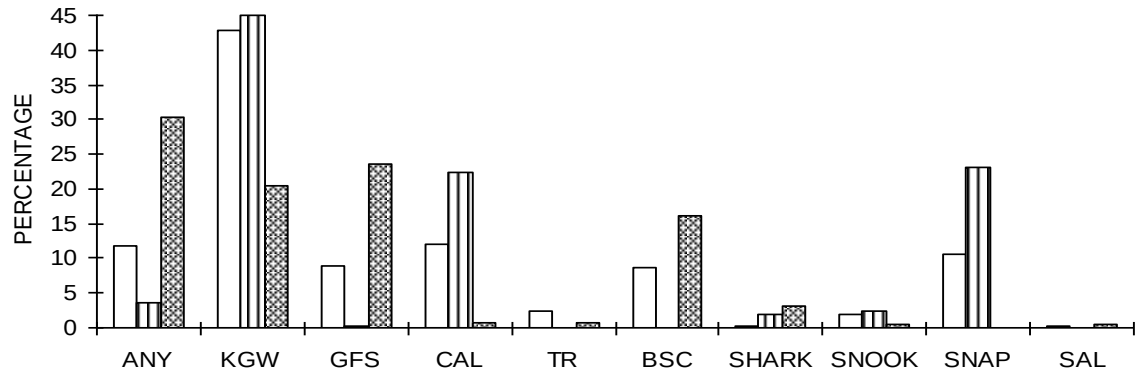
- species codes are shown in Table 10.

Recreational **Commercial line** **Commercial net**

GULF ST VINCENT



SPENCER GULF



WEST COAST

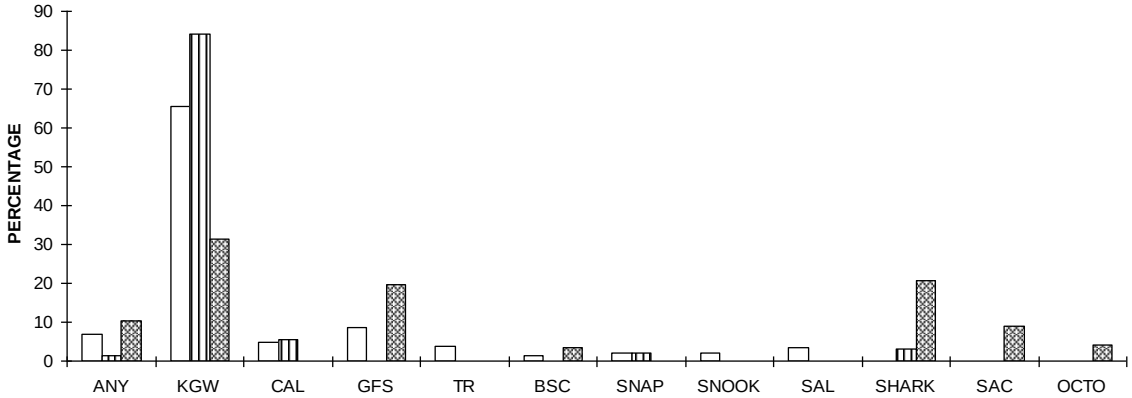
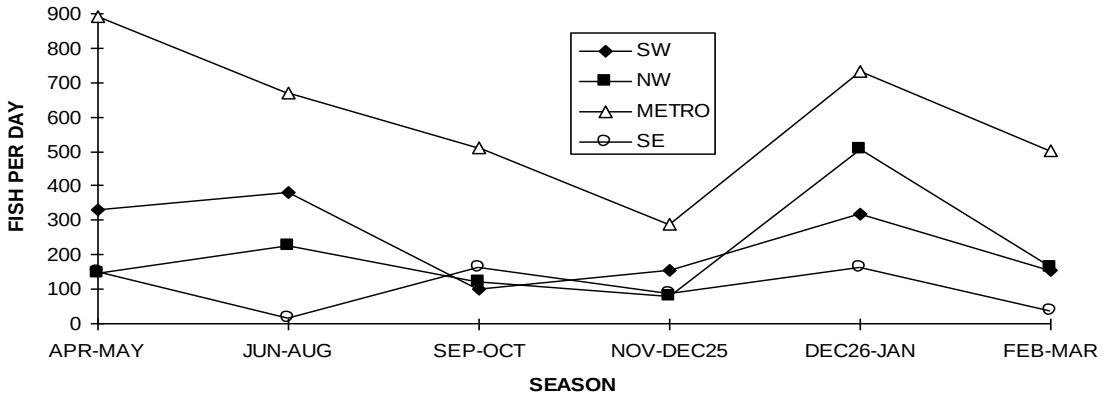


Fig. 7. Average daily harvest rates for King George whiting (*Sillaginodes punctata*).

- the point for NW Spencer Gulf in Sept-Oct covers the period Sept-Dec 25th

GULF ST VINCENT



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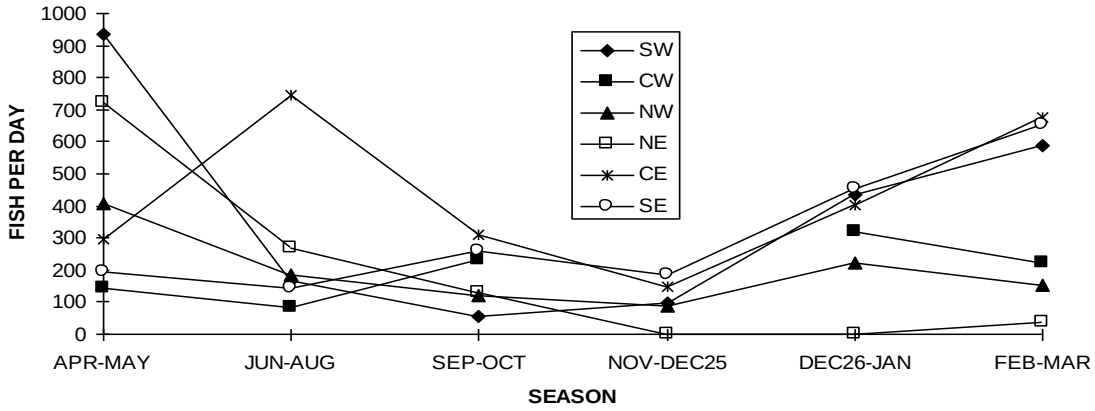

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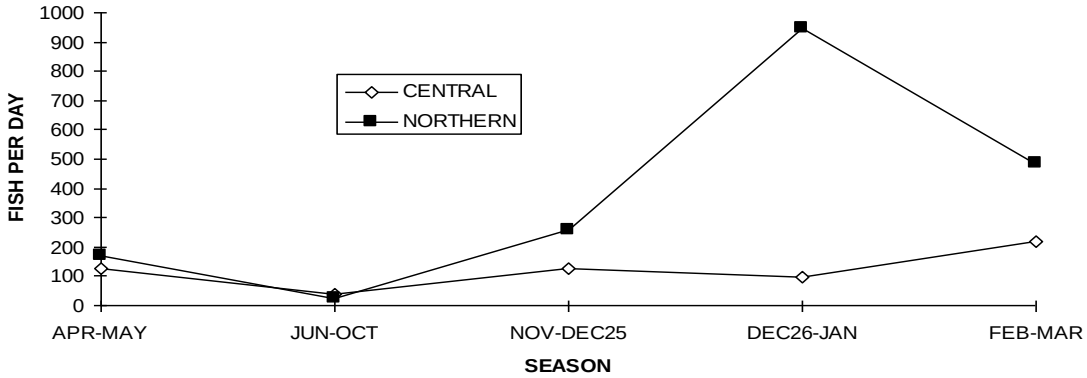
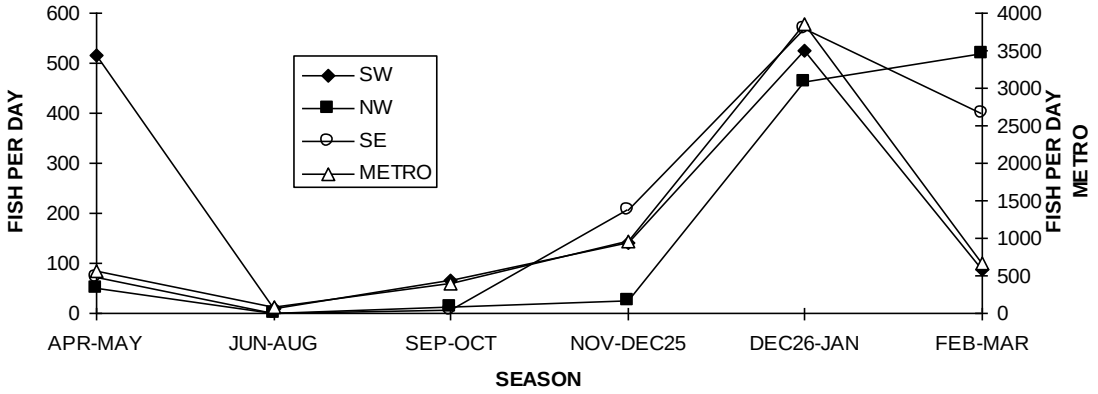


Fig. 8. Average daily harvest rates for southern sea garfish (*Hyporhamphus melanochir*)

- the point for NW Spencer Gulf in Sept-Oct covers the period Sept-Dec 25th

GULF ST VINCENT



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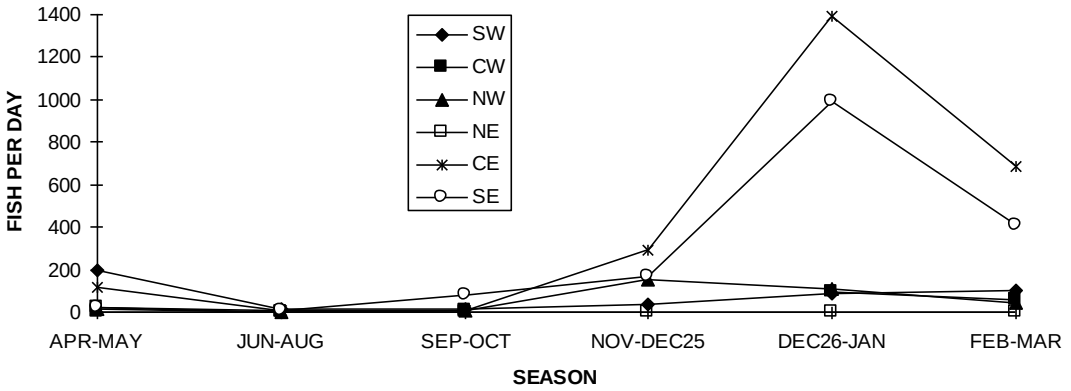

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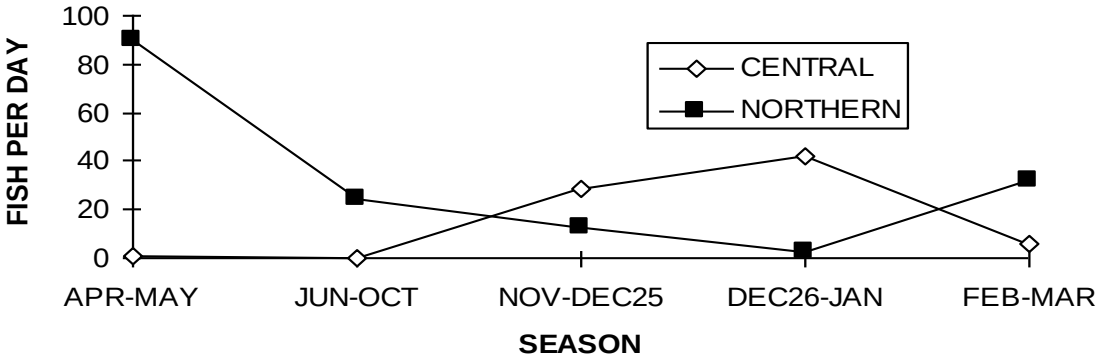

Fig. 9. Average daily harvest rates for southern calamary (*Sepioteuthis australis)*

- the point for NW Spencer Gulf in Sept-Oct covers the period Sept-Dec 25th

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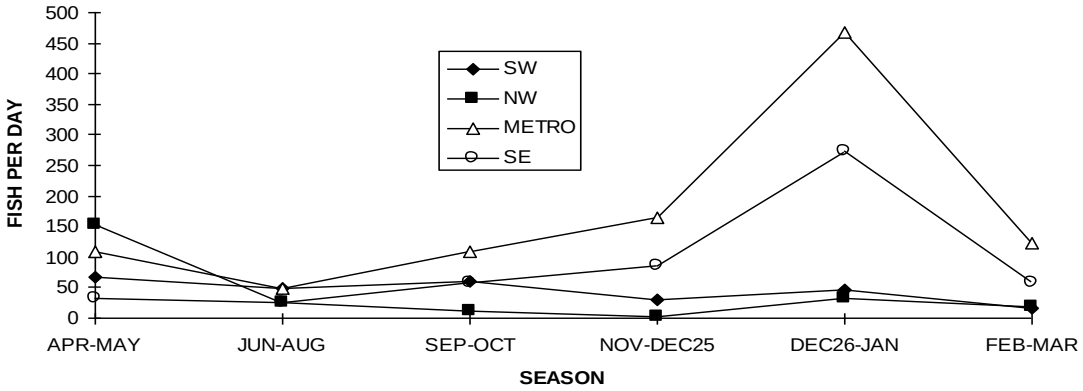
GULF ST VINCENT



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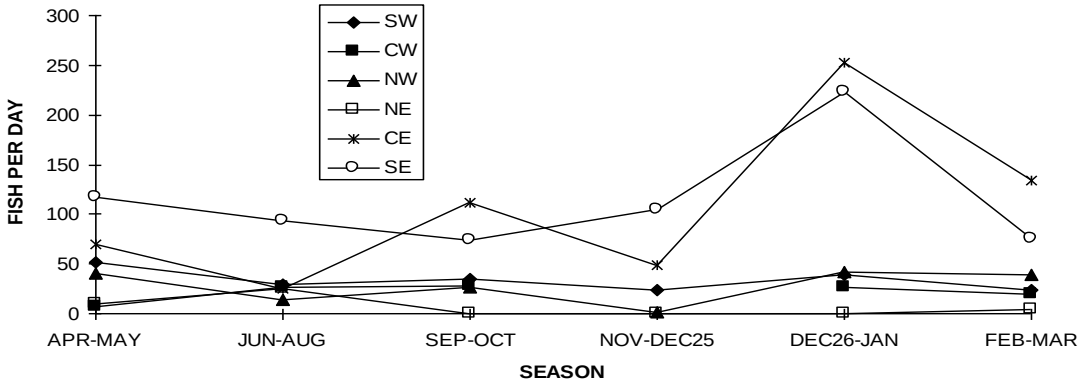

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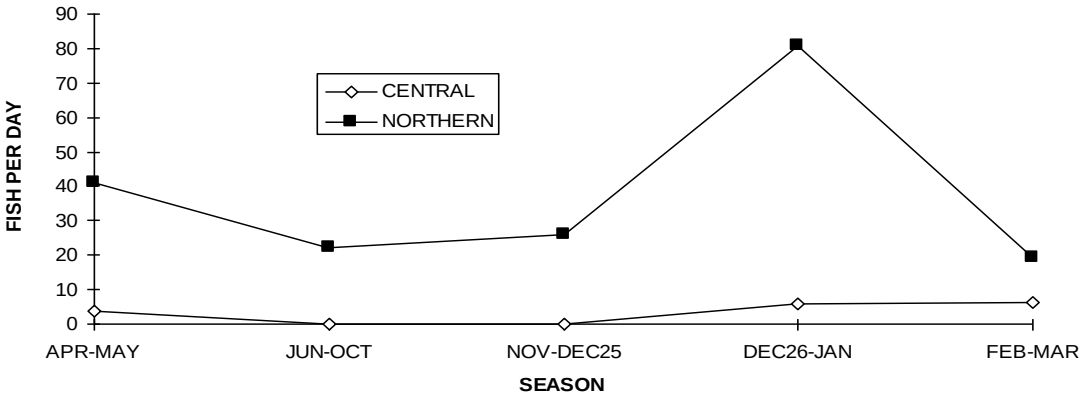

Fig. 10. Average daily harvest rates for blue swimmer crab (*Portunus pelagicus)*

- the point for NW Spencer Gulf in Sept-Oct covers the period Sept-Dec 25th

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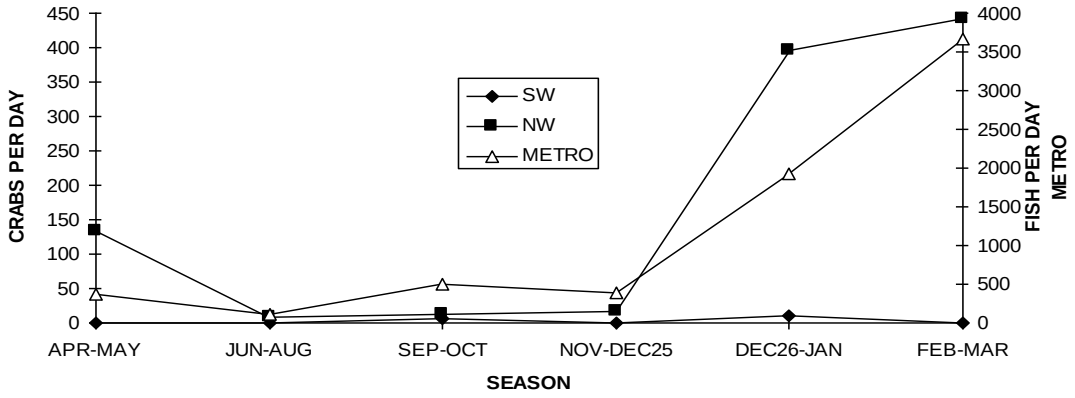
GULF ST VINCENT



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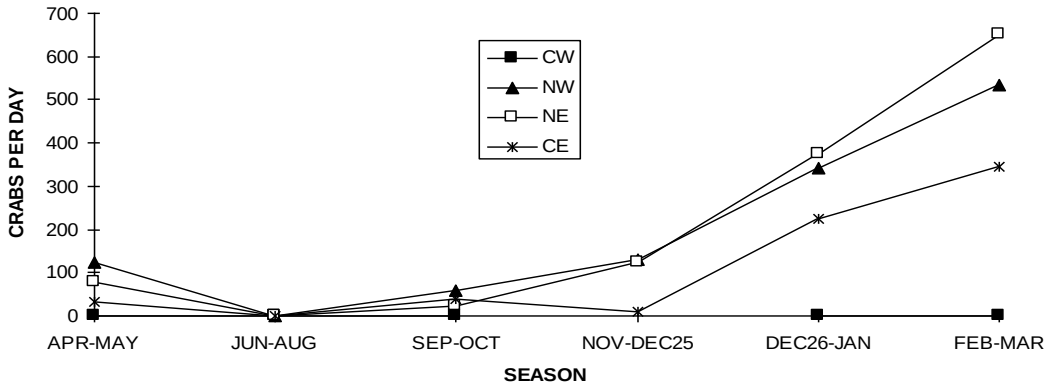

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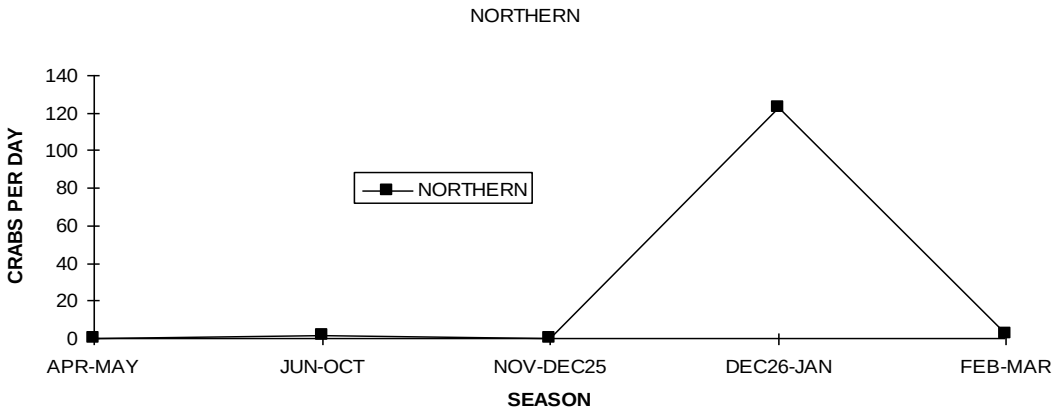
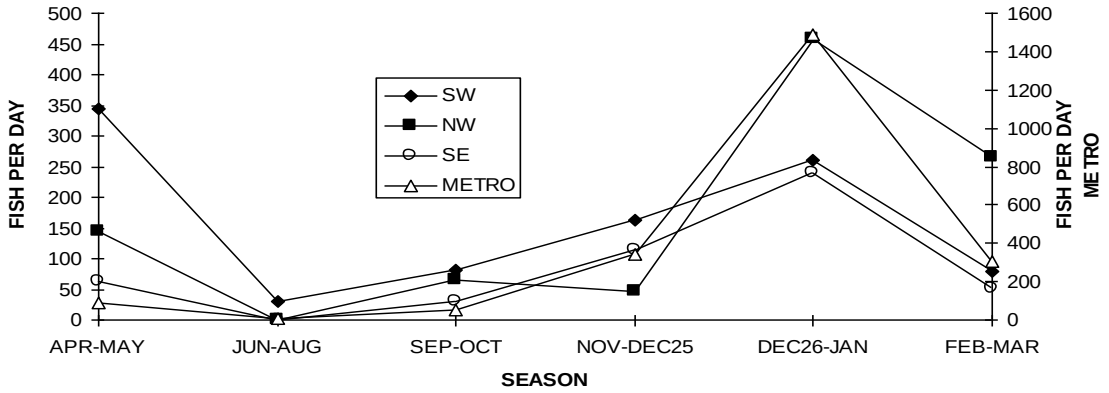


Fig. 11. Average daily harvest rates for Australian herring (*Arripis georgiana)*

- the point for NW Spencer Gulf in Sept-Oct covers the period Sept-Dec 25th

GULF ST VINCENT



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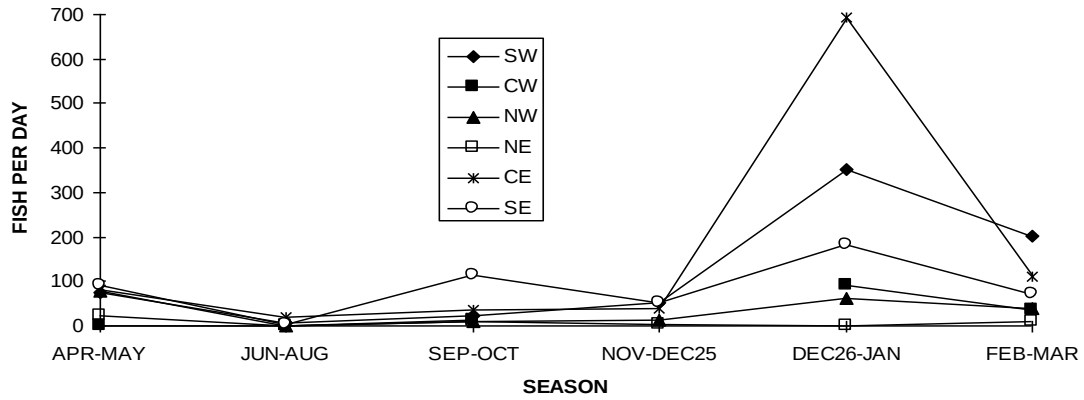

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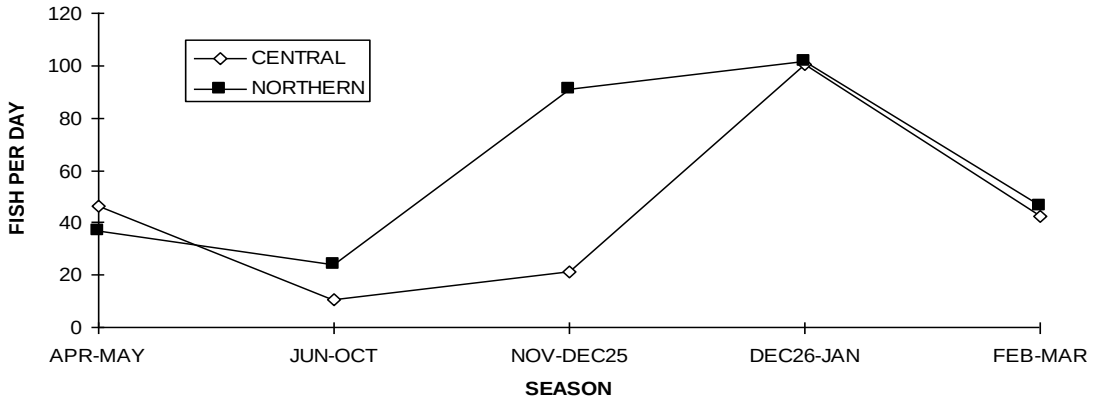

Fig. 12. Average daily harvest rates for snook (*Sphyraena novaehollandiae)*

- the point for NW Spencer Gulf in Sept-Oct covers the period Sept-Dec 25th

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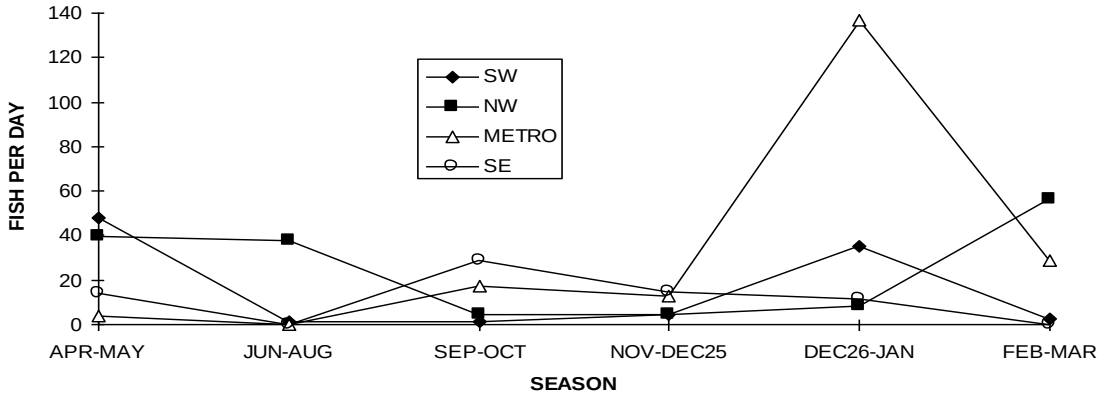
GULF ST VINCENT



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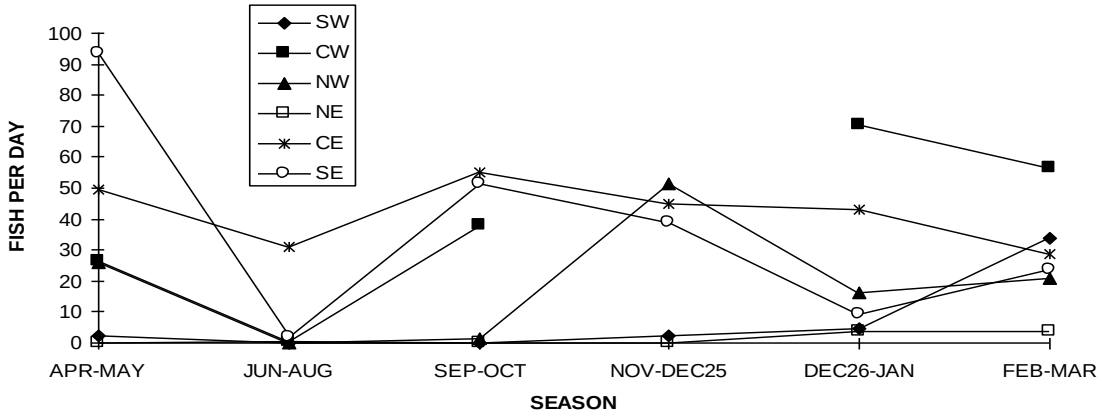

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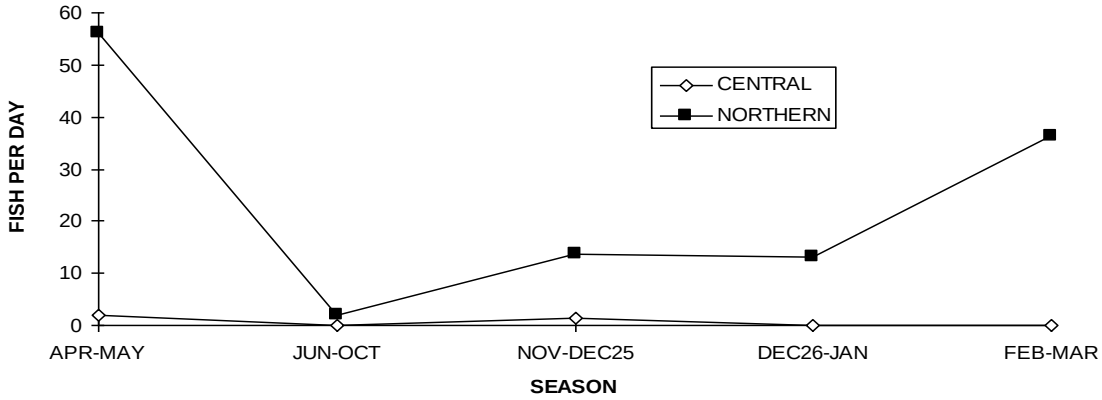

Fig. 13. Average daily harvest rates for Australian salmon (*Arripis truttacea)*

- the point for NW Spencer Gulf in Sept-Oct covers the period Sept-Dec 25th

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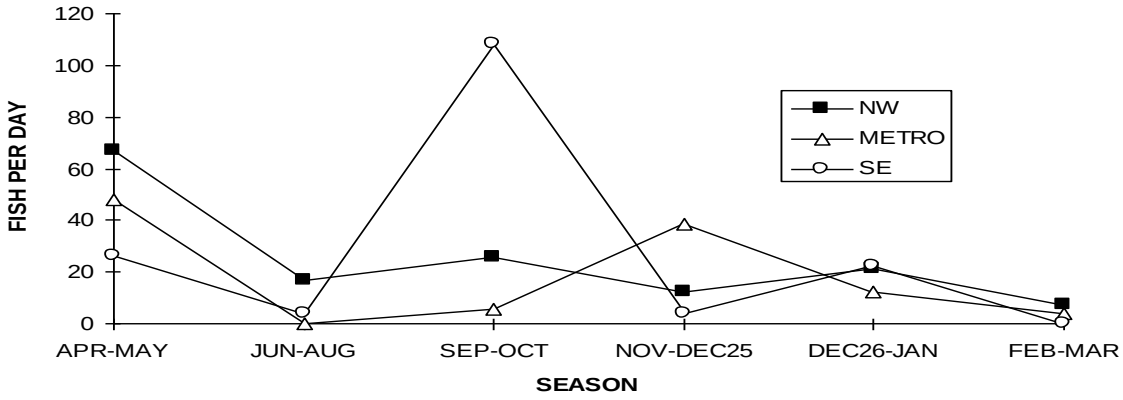
GULF ST VINCENT



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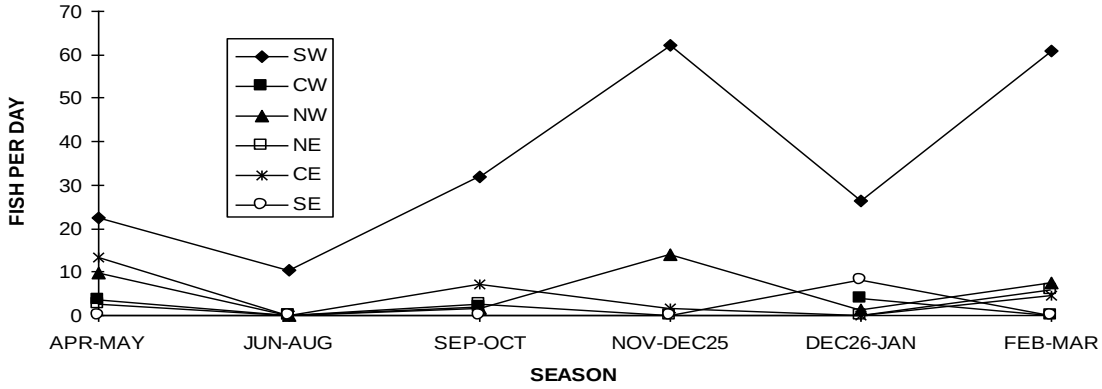

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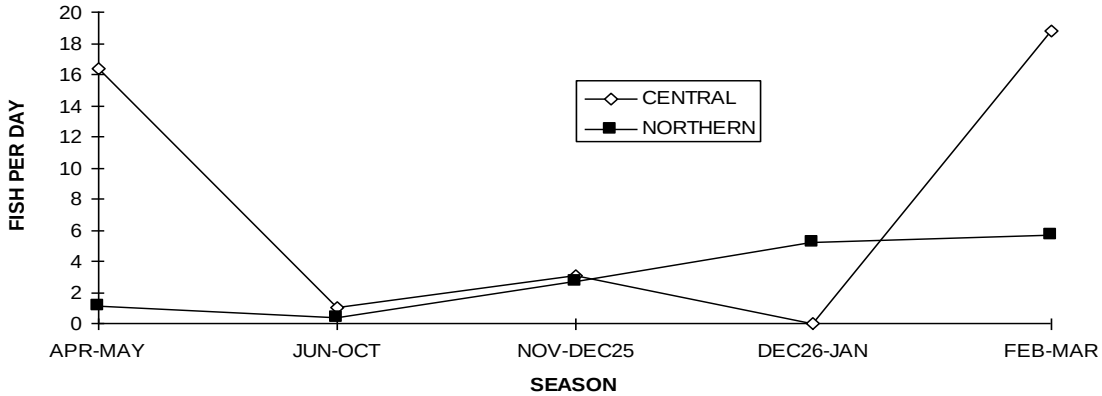

Fig. 14. Average daily harvest rates for snapper (*Pagrus auratus)*

- the point for NW Spencer Gulf in Sept-Oct covers the period Sept-Dec 25th

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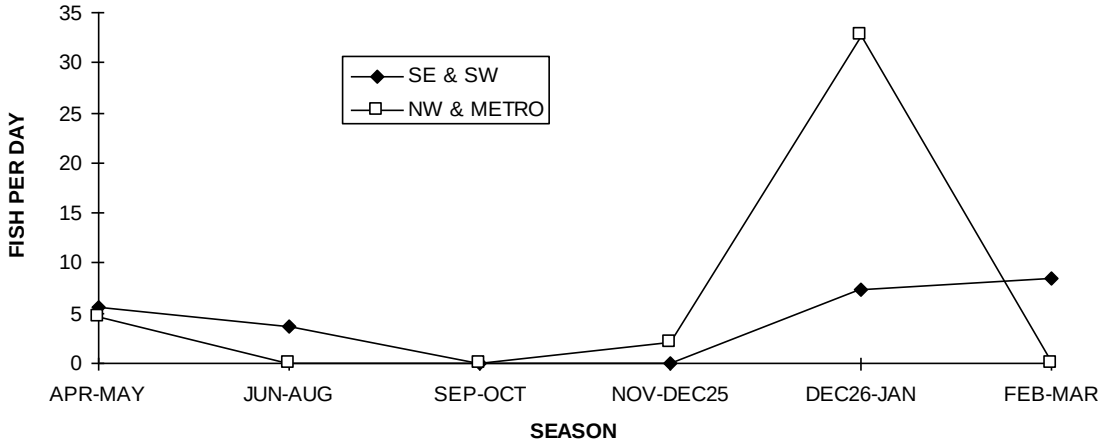
GULF ST VINCENT



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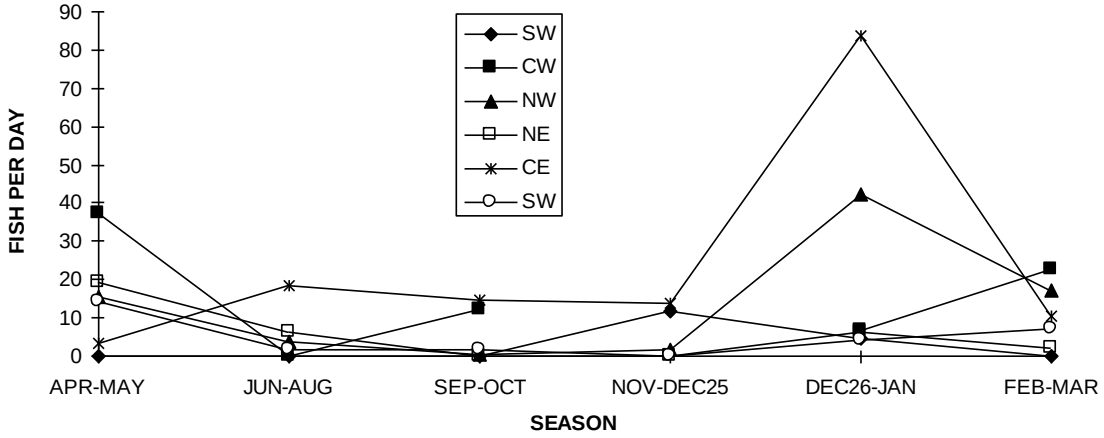
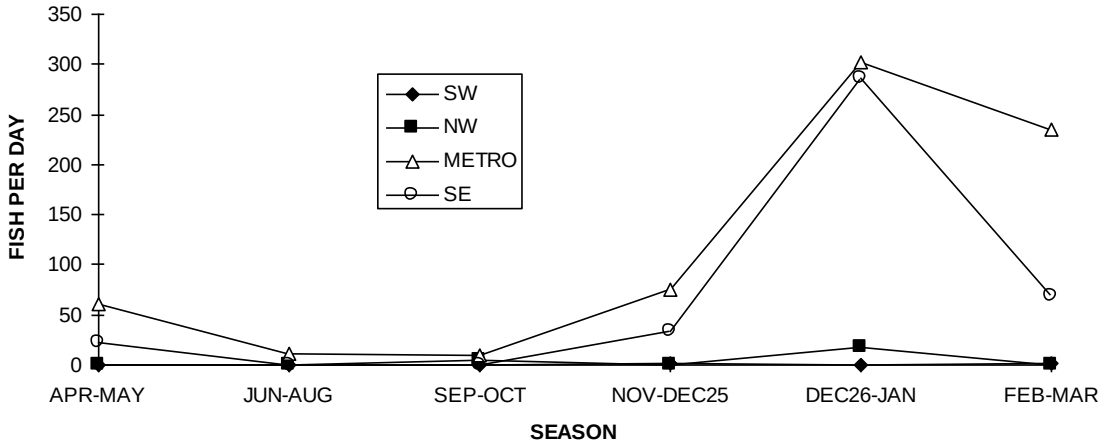


Fig. 15. Average daily harvest rates for blue mackerel (*Scomber australasicus)*

GULF ST VINCENT



SPENCER GULF & WEST COAST

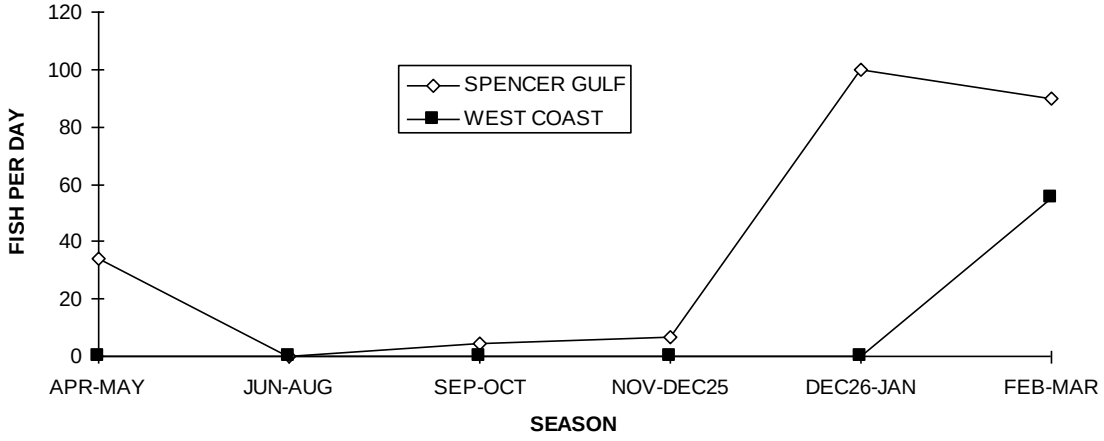


Fig. 16. Average daily harvest rates for all fish

- the point for NW Spencer Gulf in Sept-Oct covers the period Sept-Dec 25th

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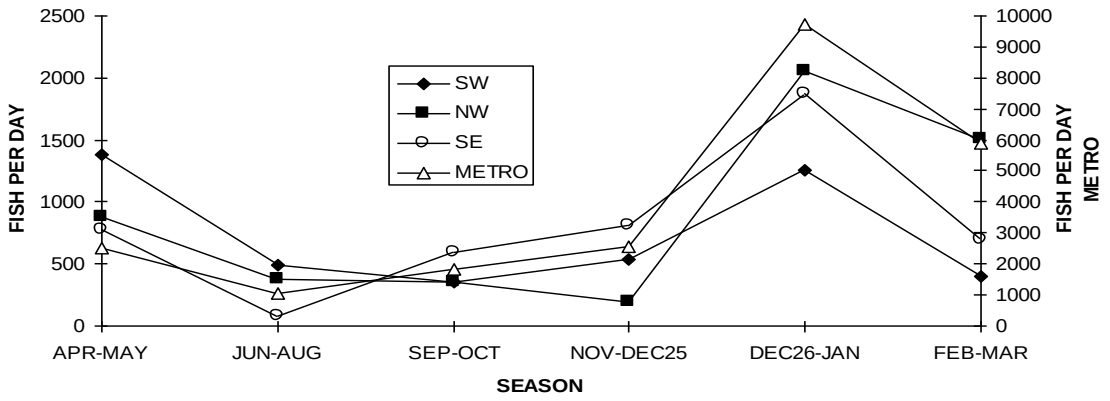
GULF ST VINCENT



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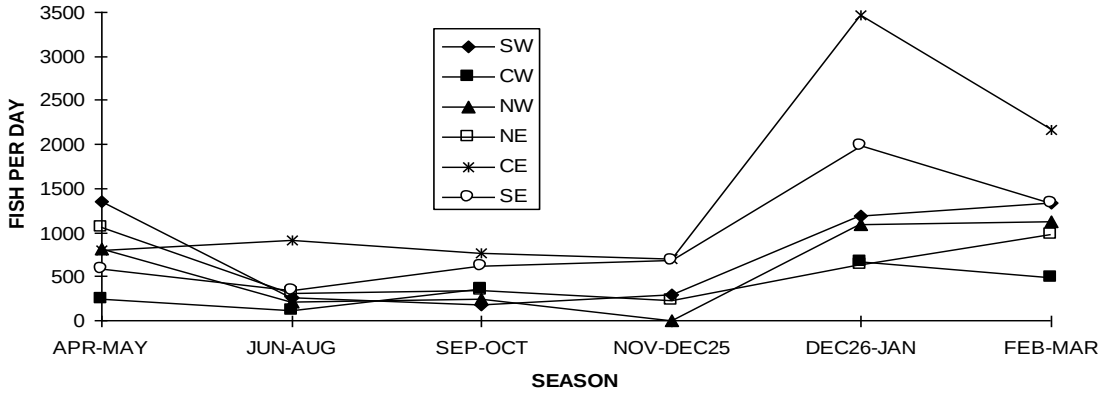
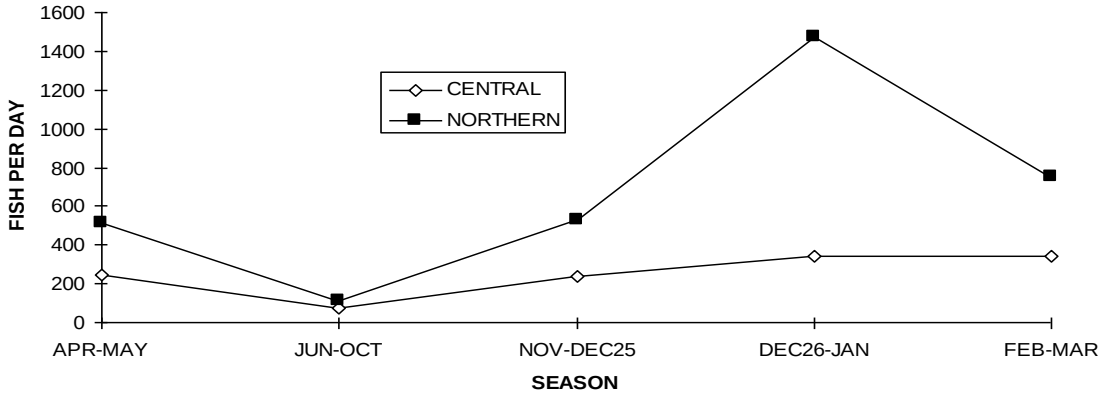


WEST COAST



Appendix 1

RAMP TRAILER COUNTS (Use 24-hour clock throughout)

* (Please complete an environmental observation form on arrival at ramp and staple it to this sheet.)

Day no. | Ramp no.

DATE: _____ RAMP: _____

Ramp arrive time: | Depart time:

No. trailers on arrival: | on departure:

Vessel type

RF - Recreational fisher
CF - Commercial fisher
NF - Non fishing

Launch times: ..... e.g.

21	time	no. people	vessel type

1			11			21		
2			12			22		
3			13			23		
4			14			24		
5			15			25		
6			16			26		
7			17			27		
8			18			28		
9			19			29		
10			20			30		

Retrieval times:

1			11			21		
2			12			22		
3			13			23		
4			14			24		
5			15			25		
6			16			26		
7			17			27		
8			18			28		
9			19			29		
10			20			30		

ENVIRONMENTAL OBSERVATION FORM

Using the following codes, please record environmental observations for each ramp.

DATE / /

RAMP NO	WD	WS	WG	CL	WC	SC

CL CLOUD COVER

0	1/8	2/8	3/8	4/8	5/8	6/8	7/8	8/8

WD WIND DIRECTION

N	NE	E	SE	S	SW	W	NW

WS WIND SPEED

0-5	5-10	10-15	15-20	20-25	25-30	>30
1	2	3	4	5	6	7

WG WIND GUSTS If gusting, up to what speed? [Refer table above]

WC WEATHER CONDITIONS

SY	Sunny
CL	Cloudy [no precipitation and not sunny]
SH	Showers [intermittent rain]
RN	Rain [continuous rain]
HR	Heavy rain
HL	Hail
SQ	Squalls [strong gusting winds usually associated with heavy rain , thunder and lightning]

SC SEA CONDITION

SEA CONDITION	CODE	SEA CONDITION	CODE
Calm	C	Moderate	M
Slight	S	Moderate - Rough	MR
Slight - Mod	SM	Rough	R

Appendix 3

Day	Ramp

Date ______________ Day Type ____ Ramp ____________________ Surveyor _____________________

ID No	LTime	RTime	ANo	Experience (local)		P'code	Devices		Location		Gear Used and Catch Details									
				Years	Trips		ES	GPS	BkNo AR?	BTime	Gtype	No	GTime	Sp	Tgt	TTime	NKept	NRet	Why	Seen ?