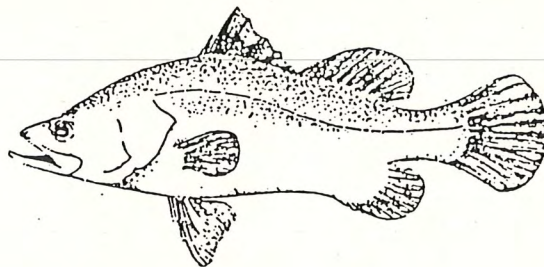


Economic Survey
of the
Gulf of Carpentaria
Barramundi Fishery

(FIRTA 85/26)

A Report to the
Fishing Industry Research Committee



Fisheries Management Branch

Queensland Department of Primary Industries

**FISHING INDUSTRY RESEARCH TRUST ACCOUNT
FINAL REPORT
(FIRTA 85/26)**

1. TITLE OF PROJECT

Economic Survey of the Gulf of Carpentaria Barramundi Fishery.

2. NAME OF APPLICANT

Queensland Department of Primary Industries

3. DIVISION, DEPARTMENT OR SECTION

Fisheries Management Branch, Division of Dairying and Fisheries.

4. REPORT

a. Introduction

The commercial fishery for barramundi in Queensland is centred chiefly on the Gulf of Carpentaria, although barramundi forms a valuable component of the east coast mixed fishery. The recorded commercial catches of barramundi show large year to year fluctuations.

In December 1980, a package of management measures was introduced into the Queensland gill net fishery. The fishery was divided into two areas, the Gulf of Carpentaria and the East Coast of Queensland, each was considered mutually exclusive for licensing purposes. Criteria for entry into the fishery was on the basis of the individual fisherman's historical and financial involvement in the fishery, and evidence of his ability to produce a high quality product.

Within the Gulf of Carpentaria gill net fishery, endorsement is limited, strictly controlled and reviewed annually. Each endorsement holder is required to undertake a full-time commitment to the gill net fishery for a minimum period of 20 weeks in any calendar year. In this context full-time gill netting encompasses net setting, gear and boat maintenance, marketing and the other ancillary operations associated with this fishery. In addition, endorsement holders are required to meet a minimum catch quota of \$10 000 per annum, derived solely from the gill net fishery.

One hundred and ninety-one endorsements were issued in 1981. This number has declined each year to the present situation where only 114 endorsements were issued in 1985. Potential latent fishing effort was removed as failure to meet the requirements to maintain endorsement in the fishery was the major reason for loss of endorsement.

It is uncommon for the number of endorsement holders to decline in a limited entry fishery. The main reason for the decline in this case was the failure to meet a minimum catch quota of \$10 000. Hence it is important that the economic implications of the present management regime be reviewed.

The project can be divided into two sections. The first sought to determine the costs incurred in operating a gill net fishery in the Gulf of Carpentaria. The second stage sought to Assess any changes in the capital structure of the fishery from 1980, when limited entry was introduced, to the present.

b Operating Costs in the Gill Net Fishery

Economic surveys of fisheries in Australia have traditionally relied on taxation returns as their source of cost and earnings data. Because of the purpose for which taxation figures are prepared, ie. the assessment of taxable income, individuals will be concerned primarily with minimising their taxation liability rather than presenting a full statement of business accounts. Hence these figures may not reflect total income and detailed expenses of conducting a fishing operation.

Gross income can also be understated by sales which are not easily traceable ie. cash sales. It is difficult to estimate the percentage of catch sold through these channels. Expenditure information taken from taxation returns does not reflect the full cost of conducting a fishing operation. Goods and services purchased directly from processors are deducted from proceeds of fish sales and not subsequently recorded as expenditure. For example a recent survey of otter trawlers in south-east Queensland indicated that approximately 10% of owners did not record any fuel expenditure on their taxation returns. Again a large number recorded low fuel costs and yet had been working full-time. A major difficulty with such data is that there is no indication of the amount of fishing effort.

This project examined a method of obtaining actual cost information from the fishermen at the time of outlay which overcomes many of the problems of utilising taxation information. The information was recorded in a log book which permits the fishermen to record each item as it is purchased as well as providing a detailed personal record.

Information recorded by the fishermen on these monthly sheets was coded into the following main categories:

- (i) Vessel and Gear Repairs and Maintenance
- (ii) Fuel and Lubricants
- (iii) Bait and Provisions
- (iv) Vehicle Variable Costs
- (v) Administrative Cost and Overheads
- (vi) Miscellaneous
- (vii) Capital Items.

The cost information was correlated with the catch information recorded in catch log book. The latter information can readily be converted to an estimate of income for each fishermen. The fishermen were also grouped according to the type of operation that was conducted. The commercial fishery is composed of two separate operations; those who set nets from a land based facility (Land Based) and those who set nets from a mother boat (Boat Based). The boat based operations have one or two Master Fishermen with assistants and have been sub-divided into two further categories based on whether the cost was shared by two or born by a single fisherman when analysed.

Table 1 shows a summary of costs incurred during the twelve months of operations in 1986 by each of the three groups of fishermen. The expenditure in Table 1 is likely to be a better indicator of the cost incurred in operating in the Gill net fishery than would be obtained from taxation information. The costs can be examined on a monthly basis, and as the information on costs for each category is itemised, further analyses are possible (e.g. Graph 1).

The estimate of income may require some further refinement. For example, the fishermen with the estimated nett loss of \$4 416 recorded more than 10 times the average weight of mixed fillets. If a slightly higher price of mixed fillets was paid (e.g. \$3.25/kg instead of \$3.00/kg fillet) a positive nett income would have resulted.

c Assessment of Changes in Capital Structure

There are few direct ways of examining the fishermen's opinion of the outlook of the industry. Any questioning on the subject is always coloured by recent experiences and a general feeling that the industry was better in previous years. However an indicator of the fishermen's perception of the industry would be the amount of money that each invested in the industry each year. If they perceived that the industry had a sound longterm future, fishermen would invest money in capital items and upgrade their present fishing units.

Data were collected in November 1985, on the amount of capital that individual fishermen invested each year for the period 1981-1985. Table 2 shows that the number of fishermen in each category which upgraded or purchased new boat(s) increased from 1981 to 1984. In 1985, this trend continued although overall numbers were lower. The numbers would have been higher as the data were collected in early November 1985 before the year was completed. The average replacement value of boats, based on November 1985 prices, also increased (Graph 2).

There was also an increase in the capacity of fishermen to freeze and hold product (Table 2). 65% of all fishermen upgraded their refrigeration unit since 1981.

On examination of the changes in capital since the introduction of the management scheme in December 1980, it would appear that fishermen view the fishery with optimism and believe that the fishery has a longterm future.

d. Publications

The study is presently being written up for publication in "Australian Fisheries". A more detailed presentation is being prepared for publication within the Monograph Series of Queensland Department of Primary Industries which will be distributed to all fishermen involved in the fishery as well as libraries.

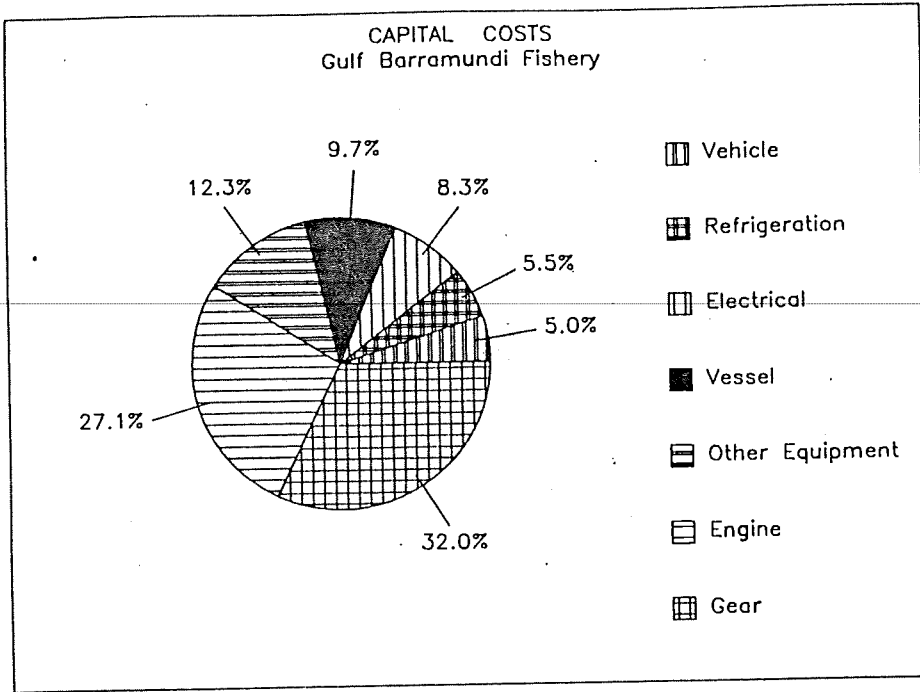
Table 1. Summary of average costs incurred, per fisherman, operating in the Gulf Gill Net Fishery during 1986 divided by category. Average income was determined from logbook information and calculated as \$10.00/kg for barramundi fillets, \$5.00/kg for salmon fillets and \$3.00/kg for mixed fillets.

	Land Based	Boat-Single	Boat-Shared
Sample Size	7	25	9
Effort (days)	189	179	371
No of Master Fishermen	1	1	2
Capital Items	4 488	5 456	5 008
Expenditure			
Repairs & Maint.	674	2 801	1 943
Fuel & Lubricants	6 536	6 173	6 036
Bait, & Provisions	2 360	2 394	1 488
Vehicle Variable Costs	656	750	404
Administration	1 886	4 040	1 852
Sundry Items	1 641	2 527	4 385
Total Expenditure	13 755	20 592	16 108
Gross Income	23 559	35 713	39 450
Nett Income	9 803	16 869	23 342
Minimum	953	- 4 416	4 071
Maximum	20 208	44 171	65 544

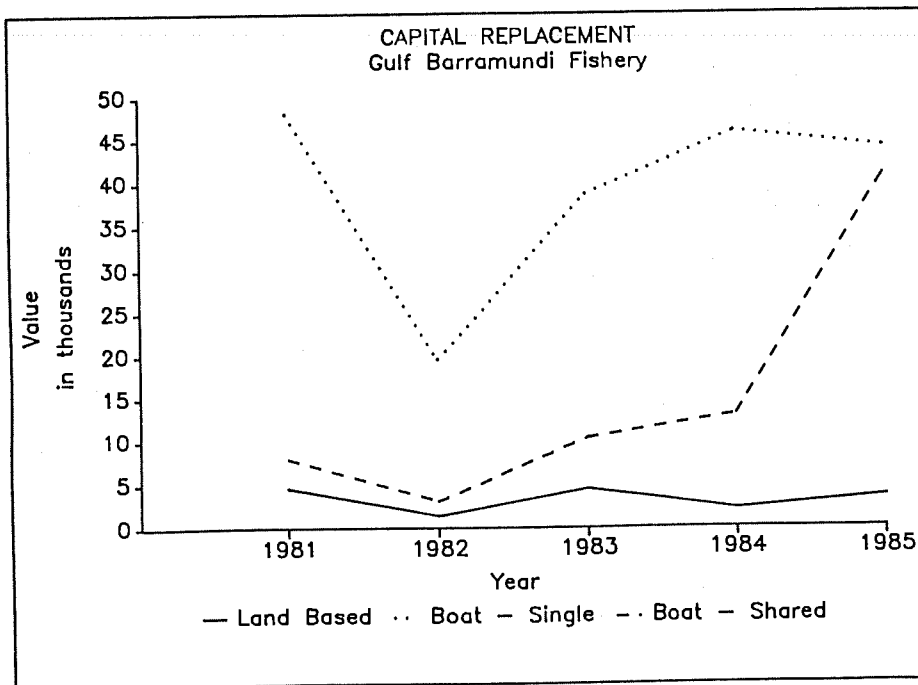
Table 2. Changes in capital structure category since the introduction of the Barramundi Management Scheme in December 1980.

	1981	1982	Year 1983	1984	1985
Boats					
Land Based.					
% Fishermen	18.2	18.2	45.5	45.5	27.3
Replacement \$ ¹	4 500	1 350	4 400	2 030	500
Boat -Single					
% Fishermen	21.0	29.8	26.3	42.1	40.3
Replacement \$ ¹	48 142	19 447	38 687	45 942	44 044
Boat -Shared					
% Fishermen	26.7	13.3	53.3	33.3	46.7
Replacement \$ ¹	7 800	3 000	10 288	13.020	40 800
Refrigeration					
Land Based.					
% Fishermen	9.0	36.4	27.3	45.5	9.0
Boat -Single					
% Fishermen	22.8	12.3	12.3	26.3	7.0
Boat -Shared					
% Fishermen	6.7	20.0	40.0	33.3	26.7

¹ Replacement value based on estimated replacement cost of unit by Fishermen at November 1985.



Graph 1. A break down of capital expenditure in the year 1986 for all of Gulf of Carpentaria Gill Net fishermen.



Graph 2. The average replacement value of boats purchased in the Gulf of Carpentaria Gill Net fishery from 1981 to 1985.

MONTHLY SUMMARY OF SPECIES LANDED FOR JUNE

Species (kg)	Total Weight Landed
Bugs	29
Large/King	968
Medium/King	35

TRIP SUMMARY FOR JUNE

Species		Weights Landed (kg)
	Trip from 03.06.87 to 04.06.87	
Bugs		9
Large/King		220
	Trip from 11.06.87 to 13.06.87	
Bugs		5
Large/King		290
	Trip from 18.06.87 to 21.06.87	
Bugs		11
Large/King		380
Medium/King		35
	Trip from 26.06.87 to 27.06.87	
Bugs		4
Large/King		78

SUMMARY OF FISHING EXPENSES FOR JUNE

	Monthly Costs (\$)	Year to Date (From 01.07.86)	
FUEL	Gas	3.29	306.94
	Oil	45.63	794.50
	Diesel	3449.28	24446.62
	Rebate	-1428.67	-10592.89
	Nett Diesel Cost	2020.61	13853.73
GEAR	Boards	0.00	500.00
	Misc	0.00	904.23
	Bets	0.00	800.00
	Wire	0.00	3418.96
ICE/SALT	Salt	0.00	91.50
OTHER	Electrical	0.00	21.95
	Misc	6.32	150.15
	Tools	0.00	60.09
OVERHEADS	Accounting	0.00	260.00
	Insurance	0.00	2214.19
	Licenses	0.00	538.00
	Mooring	0.00	415.69
	Surveys	0.00	323.00
	Telephone	0.00	19.50
	Vehicle	390.55	2180.78
REP/MTCE	Boat	730.51	4220.75
	Electrical	0.00	376.50
	Engine	280.60	9519.48
	Fridge	0.00	578.71
	Hardware	87.46	1687.25
	Nets	0.00	729.64
	Slipping	0.00	2030.77
	WAGES	Crew	3958.66
TOTAL EXPENDITURE	7523.63	86099.92	
	Capital Expenditure		
JUNE	Anchor Winch Deposit	2000.00	

**FISHING INDUSTRY RESEARCH TRUST ACCOUNT
REPORT
(FIRTA 85/25)**

1. TITLE OF PROJECT

A cost model of the otter trawl fishery for prawns

2. NAME OF APPLICANT

Department of Primary Industries

3. DIVISION, DEPARTMENT OR SECTION

Fisheries Management Branch, Division of Dairying and Fisheries

4. REPORT

Introduction

The Queensland East Coast otter trawl fishery for prawns extends along the coastline from the tip of Cape York to the Queensland/New South Wales border. There are about 1 000 trawlers in the fishery which in 1986/87 landed approximately 7 600 tonnes of prawns or two-thirds of the total Queensland production.

The otter trawl fishery has been a limited entry fishery since 1979 when the Queensland Government restricted the entry of additional boats into the fishery. This did not stop a person licensing a new vessel in Commonwealth waters. It did, however, slow down the growth of the number of vessels entering the East Coast fishery since the majority of vessels operating in Commonwealth waters off the coast of Queensland held a Queensland State License.

A number of economic surveys have been conducted into the East Coast otter trawl fishery along various sections of the coastline. These studies have generally found that the fishery is over-capitalised with too many boats operating in the fishery. However they have limited use for predictive purposes because of the absence of data quantifying fishing effort or the areas fishermen work.

This study is concerned with predicting the costs of operating an otter trawler targeting on prawns. The aims of the study are:

- to identify and determine major cost categories for vessels of different lengths;
- to detail trip profiles;

- to determine the break-even level of catches for otter trawlers operating out of different ports;
- to develop a model to predict the cost of operating an otter trawler in Queensland waters.

Materials and Methods

In order to develop a mathematical model the costs of operating a vessel together with data describing the operations of the vessel had to be collected.

The target group of fishermen were those with East Coast endorsements only, thus excluding Gulf trawlermen. Gulf fishermen face a different cost structure to the East Coast because they work out of remote centres, have much longer fishing trips and use boats which on average are much larger and more sophisticated than the east coast trawlers.

A pilot study was conducted in 1985/86 for fishermen whose home port was between Tweed Heads and Mooloolaba to test the acceptability of the logbook and method of recording costs. In 1986/87 the study was extended to include fishermen whose home port was in the region Urangan to Gladstone. The local QCFO representative assisted initially in contacting fishermen. In the ports where the QCFO representative could not be active in the selection process they were able to assist us by identifying:

- (a) which fishermen were in port at any time;
- (b) those fishermen away on extended trips; and
- (c) those likely to be involved in this type of study on a long term basis.

Fishermen were asked to record cost information for each month on a specially designed form so that it was possible to identify all expenditure items. Information about fishing vessel operations was provided by logbook data completed by fishermen. After discussions with fishermen it was decided that the most suitable format was a daily log. The detail provided by a shot by shot log was not considered necessary for the project and would have increased data input time.

The information collected from fishermen consisted of three parts:

- A description of fishing operations and an estimate of the capital invested in that operation;
- Monthly expenditure on all costs related to trawling;
- A fishing log which described the start and finish of a trip, engine hours, area fished and product landed.

Fishermen were sent monthly summaries of the cost and logbook data submitted (Appendix 1). These were sent to encourage fishermen to provide timely information and maintain interest in the program. The summaries showed landings by species and trip, expenditure by various categories and various cost analyses by month. Because of the lumpiness in the way fixed costs are incurred eg. license fees paid once a year and the fact fishermen joined the project in different months, fixed costs were estimated for each length class for the year and taken in as a set monthly amount. From July 1, 1986 the monthly summaries were a complete representation of costs supplied and trips made by each of the trawlers in the study. Because most fishermen were satisfied with the format of the logbook and monthly report no changes were made to the layout of these for the 1986/87 year.

Fifty owners agreed to participate in the project and some data was collected from all these vessels. However data from only 21 boats were used to estimate the cost model because they met the minimum requirement of 12 months continuous data. Fishermen were followed up by either a personal visit or by phone to try and encourage them to continue supplying data. The main reasons for boats not remaining in the study were the sale of the boat and fishermen not seeing the benefits to the industry and themselves of remaining in the study.

Results and Discussion

Fishing effort

Vessels with home ports south from Mooloolaba generally fished more frequently during the summer months (Table 1). The trips were usually overnight trips with the vessels returning to port each day. Within this group of vessels were those that worked predominately in Moreton Bay and those that worked outside Moreton Bay. The vessels that worked outside Moreton Bay exceed 13 m in length and are excluded from working in Moreton Bay by law. These larger vessels had a different fishing pattern to those working in Moreton Bay. Their trip lengths varied from one to eight days with more than 60 percent of the fishing trips being two days or longer (Figure 1).

The fishing patterns of the vessels in Mooloolaba reflects the size of the vessels in the sample obtained for the port and the fishing activity of those vessels. About two-thirds of the fishing trips for the year occurred from October to January and were usually one to two days.

Fishing trips for vessels working out of Tin Can Bay (Figure 2), Hervey Bay (Figure 3) and Gladstone (Figure 4) were fairly evenly spread throughout the year although slightly higher in the summer months. Trips ranged up to 14 days with a significant proportion of trips being more than four days in length.

Table 1: Number of trips per month by area

MONTH	GC	MB	MB <13	MBA >13	TCB	HB	BB	GL
July-Sept	10	18	23	10	18	19	35	24
Oct-Dec	22	36	31	45	29	21	26	18
Jan-Mar	27	33	26	38	32	27	22	29
Apr-June	22	14	21	8	21	20	20	29

GC = Gold Coast; MB = Moreton Bay; MBA = Mooloolaba;
 TCB = Tin Can Bay; HB = Hervey Bay; BB = Bundaberg;
 GL = Gladstone

For trawlers working north of Mooloolaba trips tended to be of longer duration than 1 to 2 days which was typical of southern Queensland. This would be consistent with a higher proportion of larger boats in these ports which are better equipped for longer trips and the fisheries that are worked by these trawlers. More trips were also undertaken in the cooler months which is probably a factor of the vessels and the seasonability of product.

Species

The fisheries in the Gold Coast and Mooloolaba were highly specific for king prawns (Table 2). Bay prawns were also an important species caught in Moreton Bay. Scallops were the predominant catch in Hervey Bay and were also part of the catch in Gladstone and Bundaberg. A variety of by catch was taken with Moreton bay bugs being the major by-catch in all areas and sand crabs being significant in southern Queensland.

Table 2: Percentage of each species by area

AREA	King prawns	Other prawns	Sand crabs	Bugs	Scallops	Other
Gold Coast	46	44				10
Moreton	39	27	12	7		15
Mooloolaba	92					8
Hervey Bay			8	13	74	5
Bundaberg	63			8	19	10
Gladstone	18	28		7	26	21

Cost Data

In other studies taxation returns have been used as the source of cost and earnings data. These data have been found to have deficiencies (Moxon and Quinn, 1983). A different approach was used in this study. Fishermen were asked to record each purchase on cost sheets. These purchases were grouped into the following headings and subheading :

-	Wages	-	Skipper and Crew
-	Capital		
-	Overhead	-	Accounting,insurance,licenses,mooring fees, power, survey fees and vehicle
-	Variable	-	Food,fuel,repairs and maintenance, gear, ice and salt

Wages, both notional and actual were the single largest category of expenditure for all fishermen. As a percentage of total costs wages increased with boat length which is consistent with larger vessels requiring more crew and landing more product. Variable or direct costs comprised about 40% to 50% of total costs, excluding depreciation, with fuel the major cost item in this category. Total costs increased with boat length, with the cash costs of operating a 17 metre vessel being about double that of operating a 14 to 15 metre vessel.

A number of regression models which predicted the annual and daily costs of operating an otter trawler were tried. Most of them were excluded for either lack of quality or prediction or the level of significance of the contribution of the variables included in the regression were inadequate.

A particularly good fit for a regression which predicted variable expenses was obtained using the annual cost of operating the trawler. The regression coefficients included fishing units, days fished and species targeted. Each of the coefficients was significant to the 95% level (Table 3). However refinements to the cost data are required before further development of the model can be done. We anticipate that this work would be completed in 1989.

Table 3: Regression Equation estimating variable costs for operating East Coast Otter Trawlers using annual costs

VARIABLE	CO-EFFICIENT	t VALUE
Constant	-69778	1.5
Fishing Units	367.7	4.07
Days Fishing	1326	1.86
Days Fishing Squared	- 4.68	-1.76
Bay Prawns (D)	-17787	-2.93
King Prawns (D)	- 5814	-1.17
Variation explained by regression		83.8

Future Directions

Funds have been obtained for staff to undertake a limited cross sectional survey of otter trawler operators from Yeppoon south to the border. The purpose of this survey is to test the validity of the data collected in the cost model. In addition the nominal group technique will be used to assess the perceived costs of operating a trawler. The data from the three sources will be integrated in a report to fishermen.

Publication

This study in conjunction with the further study will be written up for publication in "Australian Fisheries". A more detailed presentation will be prepared for publication within the Monographic Series of Queensland Department of Primary Industries which will be distributed to all fishermen involved in the studies as well as libraries.

FIG 1 :TRIP LENGTH — OTTER TRAWL STUDY
Moreton Bay ($\geq 13\text{m}$)

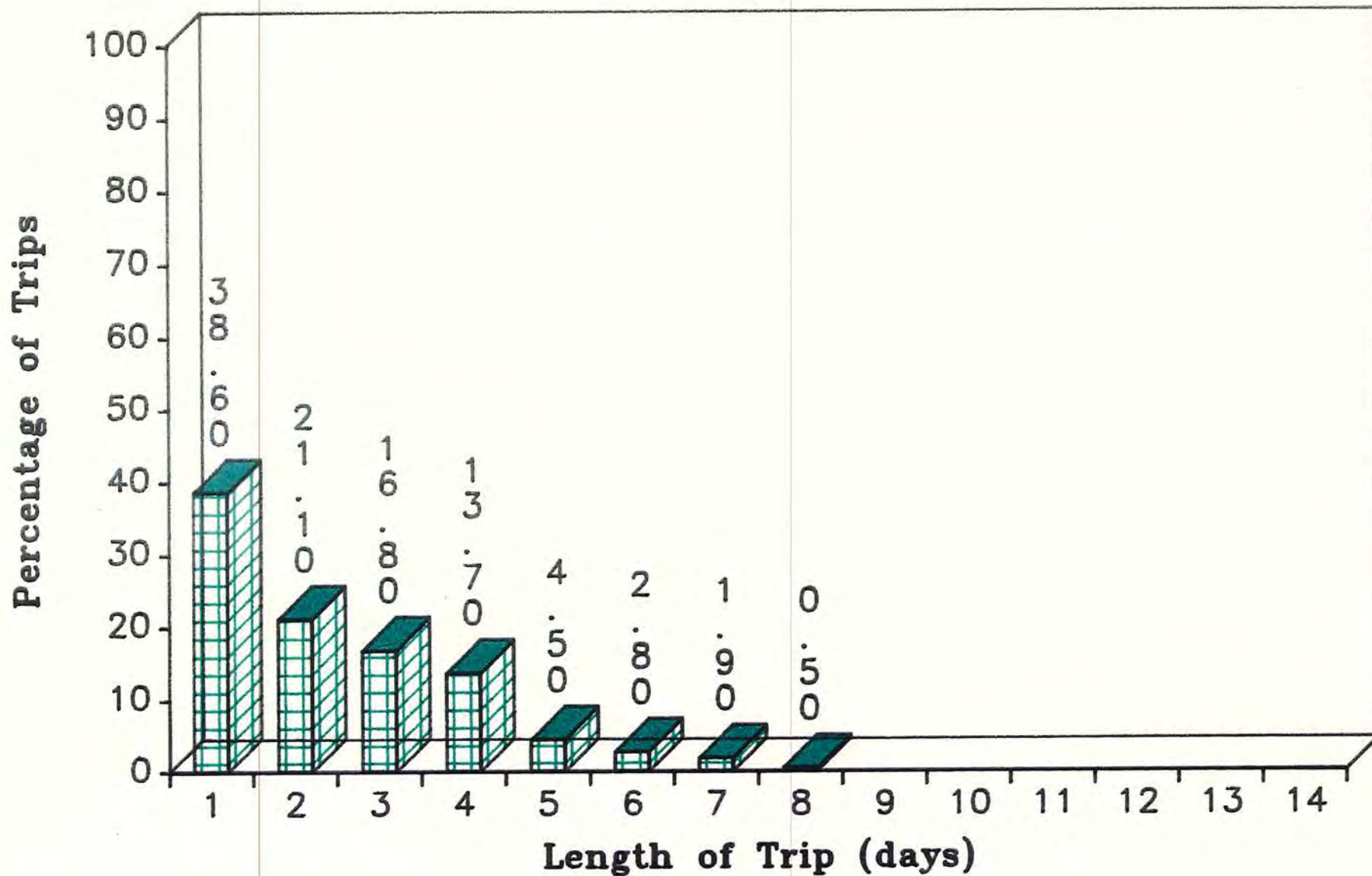


FIG 2 : DISTRIBUTION OF TRIPS BY MONTH
— OTTER TRAWL STUDY —
Tin Can Bay

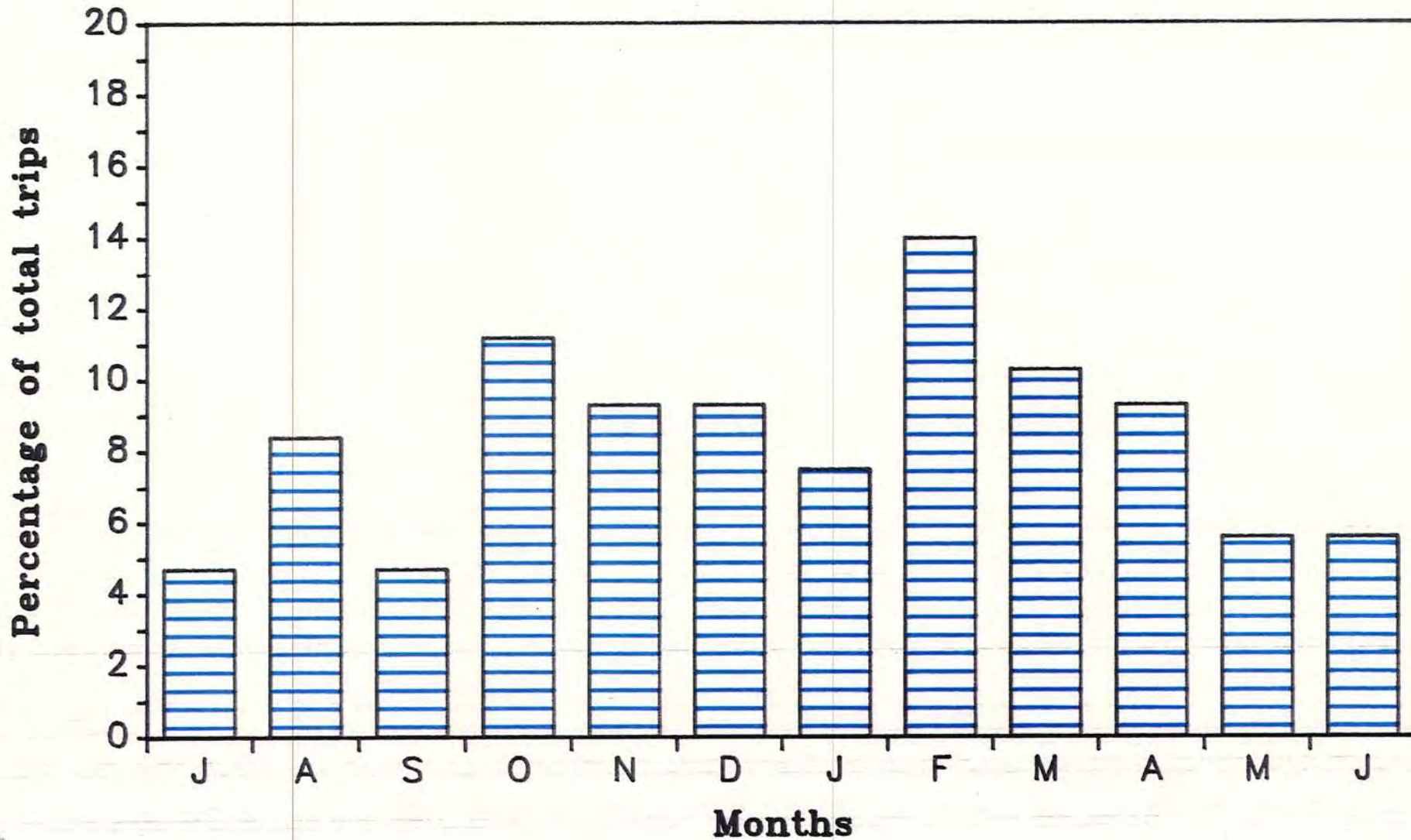


FIG 3 : DISTRIBUTION OF TRIPS BY MONTH
— OTTER TRAWL STUDY —
Hervey Bay

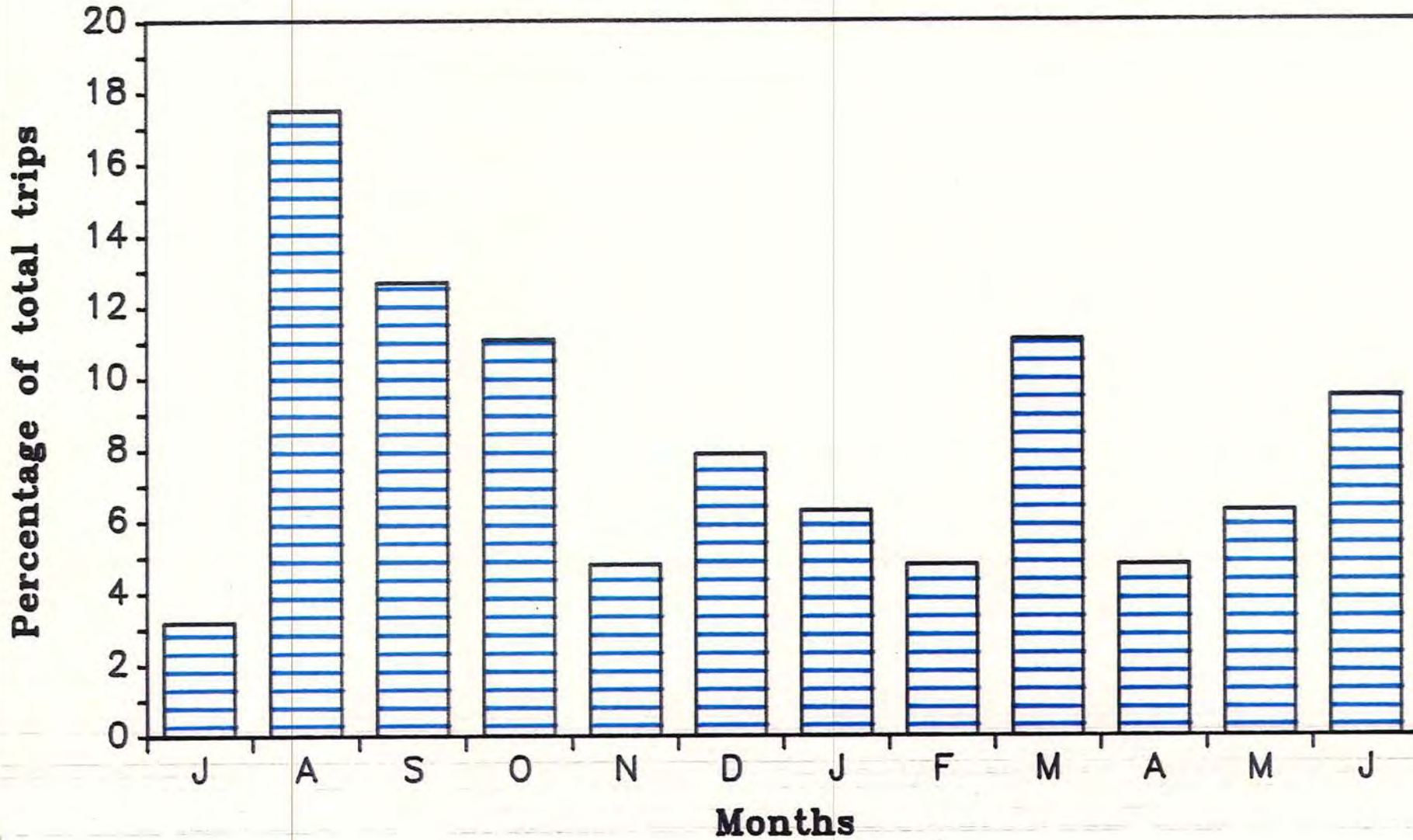
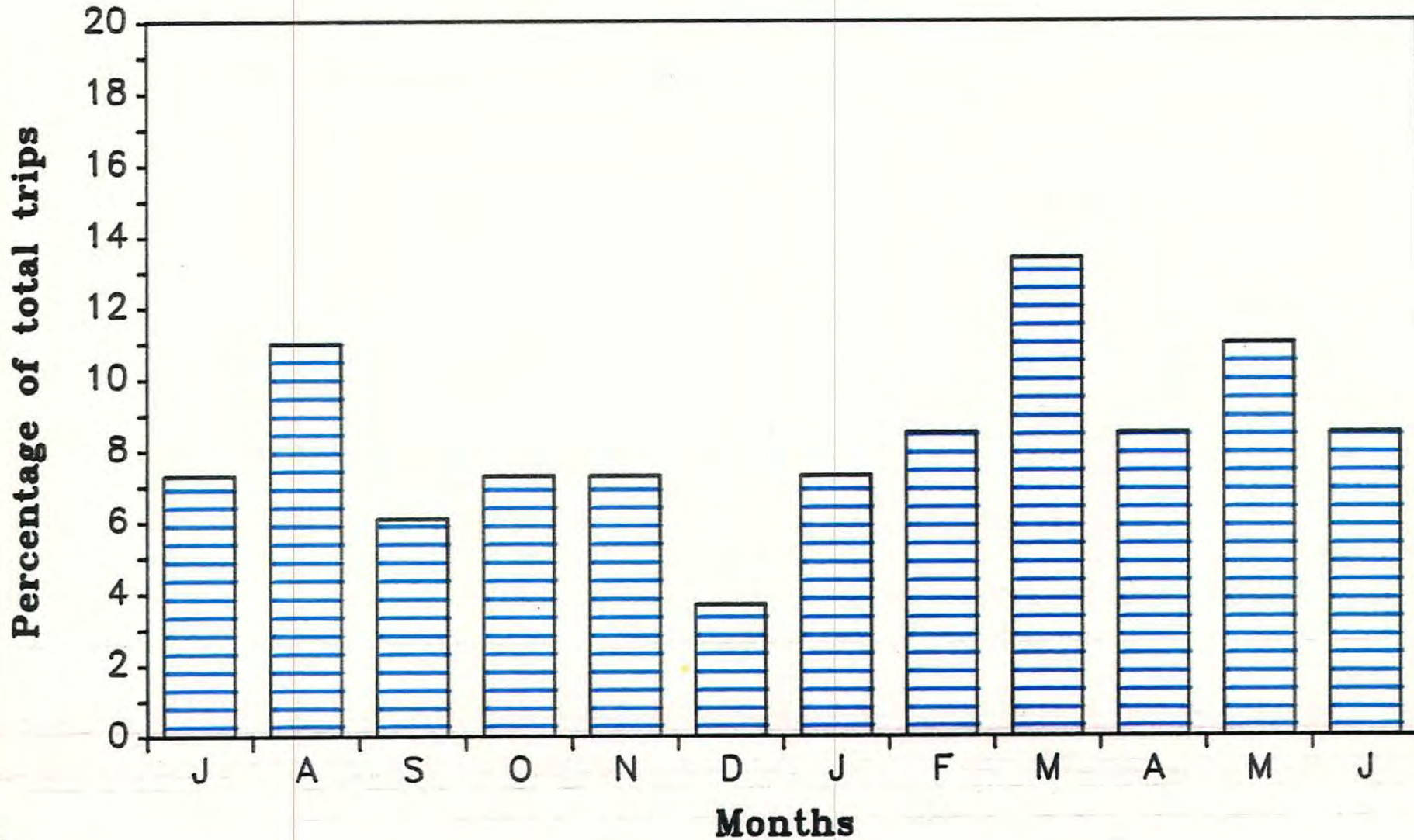


FIG 4 : DISTRIBUTION OF TRIPS BY MONTH
— OTTER TRAWL STUDY —
Gladstone



**APPENDIX I:
Logbook Data**

Example of Monthly Summary of Cost and

MONTH OF JUNE

Fisherman No. XXX

Best month for landings:

MAY

Best trip this month:

18.06.87 - 21.06.87

Best trip so far:

19.05.87 - 22.05.87

Landings for best trip so far:

Bugs -
Large/King -

25
785

Number of fishing days in month:

11

Number of fishing trips in month:

4

Cost per fishing day:

\$ 719.47

Cost per fishing trip:

\$1,978.54

MONTHLY SUMMARY OF SPECIES LANDED FOR JUNE

Species (kg)	Total Weight Landed
Bugs	29
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TRIP SUMMARY FOR JUNE

Species Weights Landed (kg)

Trip from 03.06.87 to 04.06.87

Bugs 9
Large/King 220

Trip from 11.06.87 to 13.06.87

Bugs 5
Large/King 290

Trip from 18.06.87 to 21.06.87

Bugs 11
Large/King 380
Medium/King 35

Trip from 26.06.87 to 27.06.87

Bugs 4
Large/King 78

SUMMARY OF FISHING EXPENSES FOR JUNE

	Monthly Costs (\$)		Year to Date (From 01.07.86)
FUEL	Gas	3.29	306.94
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	Misc	6.32	150.15
	Tools	0.00	60.09
OVERHEADS	Accounting	0.00	260.00
	Insurance	0.00	2214.19
	Licenses	0.00	538.00
	Mooring	0.00	415.69
	Surveys	0.00	323.00
	Telephone	0.00	19.50
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WAGES	Crew	3958.66	40103.61
TOTAL EXPENDITURE		7523.63	86099.92
	Capital Expenditure		
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