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FRDC GRANT T93/051

***A 25 YEAR CATCH AND EFFORT TIME SERIES DATABASE
FOR THE EAST COAST OTTER TRAWL FISHERY***

**FINAL REPORT
NOVEMBER 1995**

Applicant

**Fisheries Division
Department of Primary Industries
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While considerable advances are being made in the development of modern assessment methods for tropical fish stocks, the collection of reliable statistical data on fish catches, fishing effort as well as the collection of species and length composition data continue to be the major bottle-necks.

The absence of reliable data usually leads to working hypotheses concerning the size of the fish stock which are very likely to be very imprecise or even grossly erroneous, but will still be used as they are the only estimates available.

Clearly, there is no substitution for the labourious and routine collection of basic data.

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EXECUTIVE SUMMARY

This project was extremely successful in identifying and collecting catch and effort data for the East Coast Otter Trawl Fishery (ECOTF) from more than 800 trawlers for the period 1969-1987, providing a sound building block for a time series dataset of almost 200,000 operations.

The major sources of data include individual fishermens diaries and research/monitoring projects undertaken by the Queensland Department of Primary Industries (QDPI), Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australian Fisheries Management Authority (AFMA) and Queensland Fisheries Management Authority (QFMA) and other agencies. At the conclusion of the project the largest single data source was individual fishermens diaries (Figure 1). It should be noted that diaries are expected to provide about the same amount of data again over the next year or so.

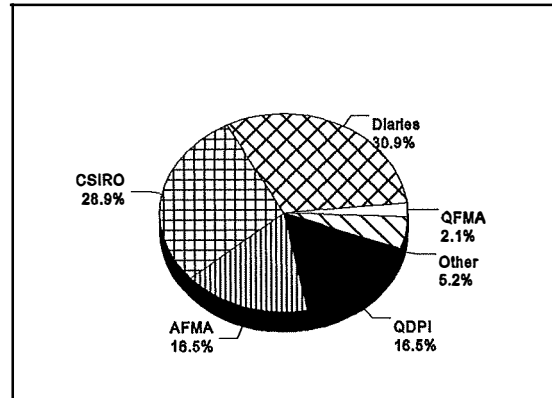


Figure 1. Major sources of data

Fisheries fortunate to have substantial time series catch and effort datasets such as the Southern Bluefin Tuna Fishery have achieved these through continuous monitoring programs (ie. logbooks) over a long period of time. By amalgamating individual fishermens diaries and research/monitoring programs identified which had been 'forgotten' or 'lost' a significant amount of data was collated in a short period of time and at relatively minimal cost.

The success of this project has resulted in similar programs being implemented for the non-trawl fisheries of Moreton Bay (1994) and more recently to gather data on recreational fishing activity in Queensland.

The cooperation and response from individual fishermen in providing personal records was excellent. Diaries have been collected from almost 80 vessels and without exception the information has been of a high standard. In addition, many fishermen providing information appreciated the importance of time series data and volunteered additional information. In particular this included documenting major gear changes over the years (eg. twin to quad gear) when providing their information.

The project clearly revealed that such information is usually held by fishermen who are in their senior years and it is imperative to gather the information before they (or their personal diaries/logs) are no longer accessible. During the project there were several occasions where retired fishermen had recently disposed of their old records. In each case they were extremely disappointed that they had not been approached earlier.

The project was also been successful in identifying all of the major research/monitoring programs relating to the ECOTF since 1969 and obtaining the associated data in either ASCII format,

original data collection sheets, or both. The validation and integration of this data required more resources than originally anticipated. In particular, the identification of vessels both within and between each of the datasets proved to be extremely difficult and time consuming. Further, one of the major datasets located as ASCII files contained un-acceptably high levels of coding errors and was essentially un-recoverable. Fortunately, in this case the original logsheets were also located and with re-punching/validation the data is recoverable.

Although outside the objectives of this project it is worth noting that a significant logbook program operating during the late 1950s was identified, although no information has been located to date. A copy of the logbook used is provided in Attachment 3.

The sheer volume of data collected, the magnitude of the resources required to identify vessels both within each dataset and between datasets and the need to re-punch/validate one of the datasets has resulted in the database not being fully operational at this point in time. These issues are being addressed 'as time permits' within QFMA. In addition, preliminary discussions have been held with other agencies interested in developing the database further in terms of assisting the process.

In summary, the \$47,000 provided by FRDC to undertake this project successfully provided a large dataset in a relatively short period of time. To appreciate the amount of data collected it could be equated to almost the equivalent of 10 years fishing activity as recorded from the Northern Prawn Fishery logbook program. When completed the data will compliment the comprehensive trawl logbook program which has been in place since 1988.

Finally, fisheries research/monitoring programs are inherently costly to operate and it is of concern that this project identified several programs whereby the information was un-accessible as the data had either been 'forgotten' or 'lost'. Subsequently, it is recommended that consideration be given to developing and adopting a process of archiving the data collected through 'once-off' research/monitoring programs, whether through the principal agency or the funding agency.

PROJECT INFORMATION

Project Title : A 25 year catch and effort time series database for the East Coast Otter Trawl Fishery

Project Reference No. FRDC T93/051

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Duration of Project 1993 - 1994

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OBJECTIVES

1. Establish a detailed and comprehensive time series catch and effort database for the East Coast Otter Trawl Fishery for the period 1969-present. This will be achieved by :
 - processing all individual fishermens data collected to date
 - identifying and liaising with all fishermen who have kept records of their fishing activity on the east coast with regards to providing their information
 - validating and storing the data onto a database
 2. Provide a statistically valid sample of trawl fishing operations on the east coast since 1969, targeting :
-

- a 20% coverage for the entire fishery in any one year
 - up to 100% coverage for some fishing grounds (eg. Moreton Bay or Princess Charlotte Bay) for some years.
3. Provide historic baseline data for industry, management and research to assess the fishery and to provide suitable data for future stock assessment and modelling type research.
-

BACKGROUND

A comprehensive review of the East Coast Trawl Fishery in 1992 (The East Coast Trawl Fishery Situation Report, September 1991) concluded that the fishery is fully exploited and that there is capacity far in excess of that required to take the current catch.

Since the release of the Situation Report there has been considerable discussion on the appropriateness of various management strategies for the ECOTF. In particular, the effectiveness of less interventionist methods (eg. buy-back, 2:1 surrender provision upon replacement, etc) have been compared to more drastic methods such as strict eligibility criteria, compulsory unit loss, quota management etc.

Development of a comprehensive management plan for the ECOTF has proved to be extremely complex. While there has been several major reviews and assessments of the ECOTF since the mid 1970s (Jarzynski (1975), the Commonwealth Department of Primary Industry (1982), and the Situation Report (1991) no comprehensive Management Plan has been developed and implemented for the ECOTF.

Sophisticated time series analyses of catch-per-unit-effort data and fleet dynamics is required to fully assess the fishery/fisheries and evaluate management options. Unfortunately, no comprehensive nor continuous data collection program was in operation on the east coast prior to the introduction of the current logbook program in 1988 to provide the type of information required for such analyses.

Establishment of a 25 year time series database to support the current logbook program would enable much more detailed analyses of the fishery than is currently possible. For example, it would :

- provide baseline historic data that would ensure a much greater understanding of the current status of the fishery, what changes have taken place and why, and finally what changes are likely under both current and proposed fishing practices and/or management regimes.
- permit the development of a dynamic, multi-species, multi-fleet, spatial model to describe, monitor and predict the effects of fishing pressure on species composition, abundance and population structure.
- provide historic baseline data for other stock assessment research projects such as the joint QDPI/CSIRO project 'Environmental effects of prawn trawling on the far northern section of the Great Barrier Reef' currently funded by GBRMPA.

A time series database will provide a much greater understanding of the current status of the resource, what changes have taken place and why, and finally what changes are likely under both current and proposed fishing practices and/or management regimes. It will permit both industry and management to comprehensively assess management options and adopt the best possible management strategies.

In addition, the availability of baseline data will assist in distinguishing 'hear say' and emotional claims during management debates. The project gave the opportunity to draw together data on the fishery from various data sources, in various formats and from various organisations into a common validated format. This information is invaluable and there would be no other way to acquire such data. It was also a good public relations exercise giving fishermen valuable input into the process as their assistance was essential to the project.

METHODOLOGY

Identification of Data Sources

Communications with staff from QFMA, QDPI, CSIRO, AFMA, QCFO, other agencies and liaison with individual fishermen, resulted in several research/monitoring programs being identified. These programs were conducted for varying periods of time between 1969 and 1987 and generally were either voluntary logbook programs being conducted in isolation or a component of a more detailed program (Table 1).

| Source | Project |
|--|--|
| QDPI | Economic survey of the ECOTF |
| | Voluntary Trawl Research Logbook Program |
| QFMA | Additional logbook data |
| CSIRO | Voluntary Research Logbook Programs (Moreton Bay, South-east Queensland and North Queensland) |
| AFMA | Northern Prawn Logbook Program |
| Other | Voluntary Research Logbook Program |
| Individual Fishermens diaries | |
| Uncollected logbooks (ie. Logsheets from previous programs that were never collected) | |

Table 1. Major data sources

Database Design

Background

During the initial phase of the project data was processed on a PC database developed during the pilot study undertaken prior to this project. However, it soon became apparent that a PC database was inappropriate for what was rapidly evolving into a large and complex dataset. In particular, the ability of PC databases to accommodate :

- large datasets
- both date and time variables and the subsequent derivation of hours trawled, and
- complex validation matrices.

resulted in the data being transferred to the HTRAWL database within the Queensland Fisheries Information System (QFISH).

QFISH was established in December 1992 and is a comprehensive relational database derived from the Australian Fishing Zone Information System (AFZIS) developed jointly by AFMA and CSIRO. This provides a common database structure, validation procedures and coding conventions to AFZIS. A copy of the Database Dictionary is provide in Attachment 1.

Major Look-up tables created

Boat Table

The development of the primary boat table (ie. the master list of vessels) was required to :

- minimise collection and processing of data which may have been provided to previous programs
- ensure individual fishing platforms are consistently identified through time
- permit detailed fleet dynamic studies to be undertaken at a later date.

The identification of individual fishing units (ie. a particular hull) and subsequently the ability to accurately track and count vessels accurately both temporally and spatially is common to catch and effort information systems. Vessels are generally identified by the Symbol or licence number active at the time the information is collected. Unfortunately vessels can be assigned different symbols over time. For example, a vessel which was assigned four symbols over a five year period could be counted four times.

The difficulty of accurately identifying vessels is further exacerbated when creating a single database from numerous discrete datasets. Within several of the datasets obtained from previous research/monitoring programs vessels were identified by various means, for example :

- vessels were identified by the logbook number. Only by locating all of the available paperwork and where possible the original logsheets was the boat table able to be constructed
- vessels within a single dataset had different identification codes depending on the fishing location and the date of fishing.

Grid Table

The primary position for every fishing location provided is stored in the database as latitude/longitude, irrespective of whether it was originally supplied as actual latitude/longitude (ie. from SATNAV or GPS) or derived from a particular grid system. Seven different grid systems were used in the different datasets and a comprehensive look-up table was required to consistently record positions and the corresponding position precision indicators.

Log Register

Data was collected as either hard copies (diaries, original logbook sheets, etc) or as computer files (ASCII) on disk. The log register was created to assist administratively by recording the receipt of data and its subsequent processing.

Validation

The creation of HTRAWL within QFISH was a minor task and ensured that all information processed would be subject to the same validation procedures as the current East Coast Otter Trawl Fishery, the Torres Strait Prawn Fishery and the Northern Prawn Fishery.

A comprehensive validation matrix is incorporated within the database which checks for errors. Errors are classified into groups according to the type of field affected. The error number indicates the group. These groups are :

| | |
|---------|--------------------|
| 0- 99 | Integrity errors |
| 100-199 | Position errors |
| 200-299 | Effort errors |
| 300-399 | Catch errors |
| 400-499 | Landing errors |
| 500-599 | Environment errors |
| 600-699 | Other errors |

In addition, there is an *error type* indicator which specifies the action to be taken on encountering the error. The error types are :

| | | |
|------------------|---|---|
| Key Error | - | An invalid or duplicate key value has been encountered. The error cannot be saved until the error is corrected. |
| Data Entry Error | - | Invalid data type or value entered. This record cannot be saved until the error is corrected. |
| Warning | - | This is an indication by the system of a potential problem. An error message is displayed, requesting further action, but the user may ignore it. In some situations, an error flag may be set. |
| Position Error | - | Set Position Error flag (ie. Indicating a possible error in the operation position) |
| Effort Error | - | Set Effort Error flag (ie. Indicating a possible error in the effort field) |
| Catch Error | - | Set Catch Error flag (ie. Indicating a possible error in the catch species or quantity) |
| Other Error | - | Set Other Error flag (eg. Where a field is required to be present (not null) for a particular logbook type and it is not present) |

A full list of validation checks is provided in Attachment 2.

Assessing the catch (ie. lbs or kg) and depth (fathoms or metres) was also a time consuming task. All of the data contained in HTRAWL has been standardised to metric units. However, in all cases the original values and conversion factors used have been stored with the actual record.

Data identified from previous research/monitoring programs

Introduction

Data obtained from previous research/monitoring programs was either located in ASCII format or within obsolete database applications on diskettes. At times, locating these was a major task and required considerable effort looking through old store rooms.

Integration of data to HTRAWL

The process of integrating data obtained in ASCII format was fairly straightforward, involving:

- conversion to standard ASCII in a format suitable to be imported into modern systems. This was undertaken using Unix utilities (eg. awk, zed).
- import using ISQL procedures
- importing auxiliary data to major tables
 - .. boat
 - .. grid
 - .. log register

However, in practice the actual task of up-lifting the data collected from the programs identified in Table 1 was more complicated and took much longer than anticipated. In fact it became the single most time consuming task of the project. This is not a criticism of the people involved at the time. The amount of information identified in this project that was either 'lost' or 'forgotten' was substantial and only still available due to the conscious dedication of a few individuals. It must be remembered that some of these datasets were 20 years or more old and that technology, both hardware and software, has changed dramatically in that time.

Some of the major problems encountered include :

- | | | |
|--------------------|---|---|
| duplicates | - | all of the datasets uplifted contained duplicates |
| non-existent dates | - | most of the uplifted datasets contained non-existent dates (eg. 31 September) |
-

- vessel identification - this became a very time consuming task. While some of the uplifted datasets provided simple look-up lists to identify vessels, some datasets :
 - .. had no look-up lists and these had to be generated from old documentation
 - .. provided no comprehensive look-up list and within the one dataset a vessel could be identified under three different lists depending on the date and position
 - .. the vessel was identified by logbook number so, vessels completing more than one logbook for a year had at least two identification codes
 - .. licensing databases provided little assistance as all of those available did not contain a vessel history. They simply provided 'snap-shots'.

 - data entry errors - all of the datasets were subjected to minimal validation procedures or none at all.
 - in some cases the original logsheets were located. This proved fortuitous in a number of cases, permitting the data to be compared with the original sheets. In one case this was extremely useful as a significant part of the data was either miss-punched or had been corrupted. In particular, there were :
 - date errors - catch was being attributed to the wrong day. This was presumably due to the software being used at the time not adequately handling date/time variables when trawl shots went over midnight.
 - catch weight - catch weights attributed to wrong species codes
 - position - where positions were stored as derived latitude/longitudes an incorrect algorithm had been used.
-

Individual Fishermens Diaries

Collecting diaries from individual fishermen

Identifying and liaising with fishermen who may have kept records of their fishing activity on the east coast was a major component of the project. Essentially this involved considerable field work, including :

- liaising with those fishermen identified but not contacted to date
- organising to collect information from those fishermen who have offered information
- identifying other fishermen who may hold information

Processing individual fishermens data

Two main steps were involved :

1. identify and collect personal diaries from fishermen
2. code, process and validate the personal records collected. This usually involves:
 - . transcribing fishermens diaries onto a formatted logsheet for data entry. In particular :
 - .. positions have to be derived from radar markings (using either 6 minute grids or 30 minute grids depending on accuracy of radar fixes. For example where 3 markings were provided a 6 minute grid was utilised and where 2 markings were provided either a 6 minute or 30 minute grid was used.
 - .. weights flagged as pounds or kilograms
 - .. identifying the vessel with the boat table
 - .. follow up with the fishermen where clarification was required

In some cases the information could be entered directly from the diaries.

Return of individual fishermens diaries

All personal diaries were photocopied for future validation and the original returned to the owner. In almost all cases, the fishermens requested the return of their diaries.

Some fishermen understandably, would not let the original diary be taken and copies were made of the diary.

Some fishermen asked for summary data based on their diaries and this was supplied.

RESULTS

Data Collected

The project successfully identified and collected catch and effort data obtained from research/monitoring programs for the ECOTF for the period 1969-1987. Data has been collected from more than 800 vessels, providing a sound building block for a time series dataset of almost 200,000 operations. A summary of the major component datasets is provided in Table 2.

| Source | Project | Period | Number of Operations |
|---|---|-----------|----------------------|
| QDPI | Economic survey of the ECOTF | 1985-1987 | 5,725 |
| | Voluntary Trawl Research Logbook Program | 1977-1987 | 20,981 |
| QFMA | Additional logbook data | 1987 | 5,487 |
| CSIRO | Voluntary Research Logbook Programs (Moreton Bay, South-east Queensland and North Queensland) | 1969-1979 | 50,748 |
| AFMA | Northern Prawn Logbook Program | 1980-1987 | 36,456 |
| Other | Voluntary Research Logbook Program | 1978-1980 | 11,784 |
| Individual Fishermens diaries | | 1970-1987 | 53,583 |
| Uncollected logbooks (ie. Logsheets from previous programs that were never collected) | | 1970-1987 | 1,973 |
| TOTAL | | | 186,737 |

Table 2. Data sources and their respective coverage

Data Resolution

The temporal and spatial resolution of the data varied depending on the research/monitoring program. There was certainly no consistency over time. A summary is provided in Table 3.

| Source project | | Temporal Resolution | | Spatial Resolution | |
|---|---|---------------------|--------------|--------------------|--------------|
| | | Minimum | Maximum | Minimum | Maximum |
| QDPI | Economic survey of the ECOTF | daily | daily | 6 mile grid | 60 mile grid |
| | Voluntary Trawl Research Logbook Program | daily | shot by shot | 6 mile grid | 10 mile grid |
| QFMA | Additional logbook data | daily | shot by shot | 6 mile grid | 30 mile grid |
| CSIRO | Voluntary Research Logbook Programs (Moreton Bay, South-east Queensland and North Queensland) | daily | shot by shot | 6 mile grid | 60 mile grid |
| AFMA | Northern Prawn Logbook Program | daily | daily | 6 mile grid | 60 mile grid |
| Other | Voluntary Research Logbook Program | daily | daily | 10 mile grid | 10 mile grid |
| Individual Fishermens diaries | | daily | shot by shot | 6 mile grid | 60 mile grid |
| Uncollected logbooks (ie. Logsheets from previous programs that were never collected) | | daily | shot by shot | 6 mile grid | 60 mile grid |

Table 3. Sources and resolution of data collected from previous programs

Additional Data

Additional data collected during the course of this project, included :

- . Northern Prawn Fishery data
- . Torres Strait trawl data
- . East Coast line fishery data
- . Gear information
- . Price information

While this information was not actively being sought it is often provided by fishermen as additional information.

Summary

Data from more than 800 vessels for the period 1969-1987 has been collected. This represents a significant sample of the fishing activity on the east coast over this period (Figure 4). When compared to the number of trawlers licensed to fish on the east coast (from licensing archives) and estimates of the actual number of vessels participating in the fishery this represents 10-40% of the estimated fishing activity in any one year. Discussions with fishermen indicates that for particular fishing grounds in some years this approaches 100%. In particular, this includes fishing grounds such as Moreton Bay, Princess Charlotte Bay and Tin Can Bay.

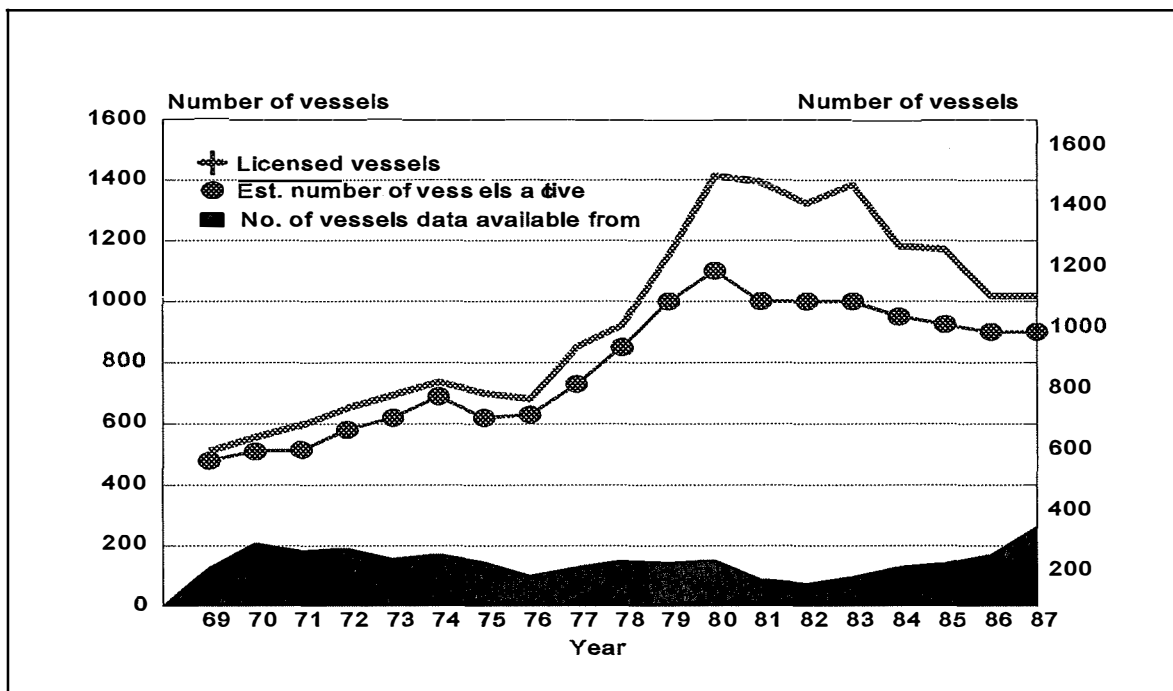


Figure 4. An estimate of the data coverage by year

RECOMMENDATIONS

A National Register

That a national register for all fisheries data be supported and implemented. It is understood that FRDC is already progressing this. The amount of information identified in this project that was either lost or forgotten was substantial and only still available due to the conscious dedication of a few individuals. Most of this information provides at the very least baseline data to compare data currently being collected. In many cases it can be used for modelling purposes.

A National Archive

Establishing a national archive for fisheries catch and effort data will require resources and support from all fisheries agencies. To progress this matter it is suggested that it be referred to the Standing Committee on Fisheries and Aquaculture (SCFA) Fisheries Statistical Working Group (FSWG). In particular, the following questions should be assessed by the FSWG.

1. Assess the need for an archive.
 2. The level of support from each fisheries agency.
 3. Resources/Funding required to establish a national archive.
 - .. should be encouraged and levied through FRDC. Further the archive should be capable of accepting all such catch and effort data in a common format, having undergone a standard and documented validation process.
 4. Framework/Location
 - .. a national archive does not necessarily imply a single database maintained by a central or delegated agency. It could simply involve a master database documenting all of the datasets contained by all agencies, including format, accessibility etc
 - .. Where data is no longer required by an agency (eg. changes in jurisdiction) then the dataset should possibly be archived into a national archive
-

CONTINUATION OF THE PROJECT

In addition to the data which was collated during the project it is estimated that :

- .. a further 30,000 records have been received, but are waiting to be coded, processed and validated
 - .. there is at least the same amount of information again which has been offered by fishermen but which has not yet been collected
 - .. there is probably the same amount of data (or more) again held by fishermen who have not been contacted to date
-

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Special acknowledgement should be given to those trawl fishermen who have provided their personal records, including :

| | | | |
|--------------------------|----------------------|-------------------------|-----------------------|
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| <i>Ted Loveday</i> | <i>John Smith</i> | <i>Bob Standon</i> | <i>Jeff Cockburn</i> |
| <i>Merv Gooding</i> | <i>Don Tripplett</i> | <i>Barry Wallis</i> | <i>Roger Green</i> |
| <i>Mark Hansford</i> | <i>Griff Jones</i> | <i>Noel Corbett</i> | <i>Lach Hardy</i> |
| <i>Trevor Louis</i> | <i>Allan Withnay</i> | <i>Toby Fest</i> | <i>Godon Goudie</i> |
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| <i>Ken Goddard</i> | <i>Noel Hoschke</i> | <i>Ray Harris</i> | <i>Len Lumley</i> |
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In addition acknowledgement should be given to :

- | | | |
|----------------------------------|---|--|
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| Jo Kovacevic (previously AFMA) | - | Jo assisted greatly during the project to locate all east coast data provided incidently by NPF fishermen when fishing on the east coast. |
| QCFO | - | QCFO's support since the pilot study has ensured the success of this project. |
-

Attachment 1 Database Dictionary

QFISH

THE QUEENSLAND FISHERIES INFORMATION SYSTEM

Catch and Effort Sub-System

Data Dictionary

Version 1.0

November 1993

Scope of this Manual

The user documentation for the logbook system is in three sections:

- i) edit and data entry user manual
 - . describes the structure and the use of the programs used to enter and edit data on the database, and the validation tests performed on the data.
- ii) retrieval users' manual
 - . describes how to retrieve data for further analysis from the database.
- iii) data dictionary (this manual)
 - . describes the structure of the database itself, and the relationship between fields on the input forms (and on the screen) and the fields on the database.

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Monitoring Fisheries in Queensland

Background

A comprehensive compulsory logbook program for Queensland's commercial fisheries was introduced in 1988, requiring fishermen to lodge catch and effort data by location on a daily basis. With over 2000 primary commercial vessels operating in 19 managed fisheries a very large data system has evolved in a relatively short period of time.

To ensure structured and cohesive development of a data collection program which has become the primary management and research information source the Queensland Fisheries Information System (QFISH) was introduced in December 1992. The program is funded jointly by the Queensland Fish Management Authority (QFMA) and the Queensland Department of Primary Industries (QDPI).

QFISH uses INGRES as the database software and is currently running on a SUN SPARCserver 630 MP using UNIX as the operating system. QFISH has been modelled on the Australian Fishing Zone Information System (AFZIS), which was developed jointly by CSIRO and AFS (now AFMA).

Objectives

The principal objectives of QFISH are :

- . to provide a comprehensive fisheries information system to meet the needs of managers, researchers and industry
- . to ensure the data meets national standards in terms of validation and coding conventions as currently being developed by the Statistical Working Group of the Australian Fisheries Council (AFC)
- . to provide a 'user friendly' interface for authorised users through the adoption of menu applications and GUI's
- . to ensure the confidentiality of individual fishermen's data

Types of information collected

Accurate information on species, distribution, catch and fishing effort is required for the successful management of any fishery. Fisheries in Queensland face many of the problems of fisheries throughout Australia and the world, such as sustainability, resource sharing and economic viability of the operators.

Comprehensive and continuous series of catch and effort data from fishermen's logbooks is

required to provide the basis for :

- . scientific stock analyses when used alone or in conjunction with other biological data (eg. recruitment studies or effects of closures)
- . certain economic analyses
- . descriptions of current fishing activity
- . short and long term trends in the spatial and temporal distributions of fishing activity
- . management and administration

To address these needs QFISH provides a comprehensive and integrated system to hold data from a wide variety of sources and formats. In summary, it includes such data sources as :

- . individual fishermen's catch and effort data (logbooks)
 - .. operation-by-operation
 - .. daily
- . landings data
- . processors data
- . boat and fishing gear data
- . environmental data
- . biological data (length frequency, tagging, individual fish data, etc)
- . survey data (eg. aerial surveys)
- . historical catch and effort data (1969-1987)

Contents

Almost 3 GBytes of data is currently held in QFISH. The two main catch and effort databases (Trawl and Mixed) contain the data collected through the compulsory logbook program which commenced in January 1988 comprises in excess of 2.2 Gbytes.

The subsidiary databases (see Database overview) contains several major components :

- | | | |
|----------|---|--|
| Summary | . | aggregated catch and effort data from the Main databases, providing quick and easy access to answering basic management questions (eg. catch and effort (number of boats and days fished) along the coast by year and month) |
| Buyers | . | data collected through the Buyers Return program. Used to validate logbook data |
| Research | . | data from research cruises/programs |

- Shark Control . contains the data collected through the Queensland Shark Control Program since 1962
- Historic Trawl . initially QDPI funded, FRDC funds have been made available to develop a time series database for the East Coast Otter Trawl Fishery. Data is being collated from individual fishermens records (diaries) and the various research logbook programs conducted since 1969.

A full description of each database component, describing the fisheries, time series, number of records and logbook types is provided in Table 1.

| Database | Major Fisheries | Period | Operations | Operation Species | Mbytes | Logbooks |
|----------------|---|----------------|------------------|-------------------|--------------|--------------------------------------|
| TRAWL | . Prawn Trawl Beam Trawl Scallop | 1988 - Present | 593,898 | 1,356,500 | 1,187 | OT01 OT02 NP04 NP06 NP07 |
| MIXED | . Line Fishery Crab Fishery Net Fishery | 1988 - Present | 587,787 | 1,117,000 | 1,029 | MI00 LF01 NC01 |
| SUMMARY | TRAWL/MIXED | 1988 - Present | 153,939 | 473,531 | 171 | |
| BUYERS | TRAWL | 1991 - Present | 16,000 | 50,500 | 5 | BU01 |
| RESEARCH | TRAWL/MIXED | | | | | |
| SHARK CONTROL | | 1962 - Present | 54,724 | 76,101 | 41 | |
| HISTORIC TRAWL | TRAWL | 1969 - 1987 | 149,102 | 395,000 | 350 | |
| | | | | | | |
| TOTAL | | | 1,555,450 | 3,468,632 | 2,783 | |

Table 1. Major components of QFISH (as at November 1993)

Major features of QFISH

From the initial design phase of QFISH several factors were identified as essential for the success of such a large information system. These included :

- . User friendly interface
- . Timeliness
- . Standardisation

- . Validation
- . Security

User Friendly interface

Many large systems tend to be very 'unfriendly' to all but the 'computer literate' QFISH has been developed with 'User friendly' interfaces to assist users getting and analysing information. These are presently menu driven interfaces for retrieving, analyses and downloading (eg. to PC's) data.

Timeliness

While the provision of comprehensive time series data is invariably the long term benefit of a fisheries information system, the day-to-day use of such information tends to be predominantly for management and administrative purposes (eg. the catch and number of boats to fish Moreton Bay). Subsequently, a common problem faced with such systems is the ability to provide management with information in real time while still being capable of providing the detailed time series data for research.

To allow management/administration inquiries to be answered in real time a subsidiary database (Summary) has been implemented. This permits basic management inquiries to be retrieved and tabled in minutes (5-10 minutes in most cases).

Standardisation

Modelling QFISH on AFZIS was a major step forward in adopting the Australian Fisheries Council (19th meeting, 21 July 1989) objectives to improve coordination of fisheries data collections throughout Australia. It also addresses a related AFC resolution that each state introduce a strategy to provide for the collection, preparation and publication, in a timely manner, of a long time series of validated catch data for all recreational and commercial fisheries and effort data for those species of importance or potential importance.

Validation

Comprehensive validation procedures have been built into QFISH. In addition, QFISH standardises the actual database design and major parameters such as species coding, validation checks and other common coding structures.

Security

The security implemented on QFISH utilises the most up-to-date systems available. In summary, three levels of security have been implemented on QFISH.

Information Technology Branch

INGaccess A menuing and access security interface for Ingres databases

Ingres Database tables and individual table items can be passworded

Processing of Data

The *source* data for the Catch and Effort database consists of paper documents (logbook sheets, processor returns, etc.) and in some components data files obtained from remote sites (e.g. research data entered at other sites).

Within the database there are essentially two types of data:

- i) raw data
- ii) edited data

The *raw* data is the source data as it has been entered on to the relevant database. This data has undergone minimal processing and may contain significant errors. Normally, the only restrictions applied to its loading on the database are that it has satisfied specified integrity constraints (e.g. correct data types or elimination of duplicates) required by the particular database.

The *edited* data has been passed comprehensive matrix of tests to check for missing data, keying errors, and for the reasonableness of the values supplied. Where errors are detected and cannot be resolved by inspection of the source documents, the originator of the data (e.g. the fishing boat skipper) may be contacted to see if the problem can be resolved.

The object of the editing process is to give data provides the best available record of what the originator of the data (e.g. the fishing boat skipper) says what happened. Data cannot be changed because, in the opinion of an editor or other fisheries staff member, something different from what is stated happened.

Records on the databases are flagged in two ways:

- i) to give status information, e.g. that a record has not yet been edited and so (possibly) should not be included in a retrieval; and
- ii) to indicate errors detected in the data (e.g. suspect position, effort or catch values) but which cannot be corrected due to lack of additional information.

These error flags provide a measure of the quality of the data on the database.

Subsequently, the edited data on the databases is essentially "cleaned-up" raw data. The reason for this is that it is not possible, for numerous reasons, to obtain agreement about any additional "error correction" or "adjustment" of this data. Even if someone "knows" that a particular item of data is wrong, and can make a "good guess" at the correct value, it can be argued that doing this is not a good thing. It is better to have a consistently derived database of known (if poor) quality.

Editing criteria for different databases may vary. Some subsidiary databases may contain only raw data. Others may have undergone substantial editing.

Further work on the data takes can be undertaken by comparing it with data from other sources (e.g. catch from logbooks against Buyers returns). Although the process of comparison with different sources can be at a very detailed level, the end result is normally an overall measure of reliability (e.g. they could lead to a statement that catch figures in a given fishery over a given season are underestimated by 30%).

Database overview

The two main databases (Trawl and Mixed) contain the primary catch and effort data obtained from logbooks filled in by fishing boat skippers (Figure 1). These databases provide a comprehensive record of catch and effort data for the managed commercial fisheries in Queensland. It also contains a master list of boats recognised by the system, and tables embodying coding systems for species, ports, activities, environment and gear, which are used throughout the database.

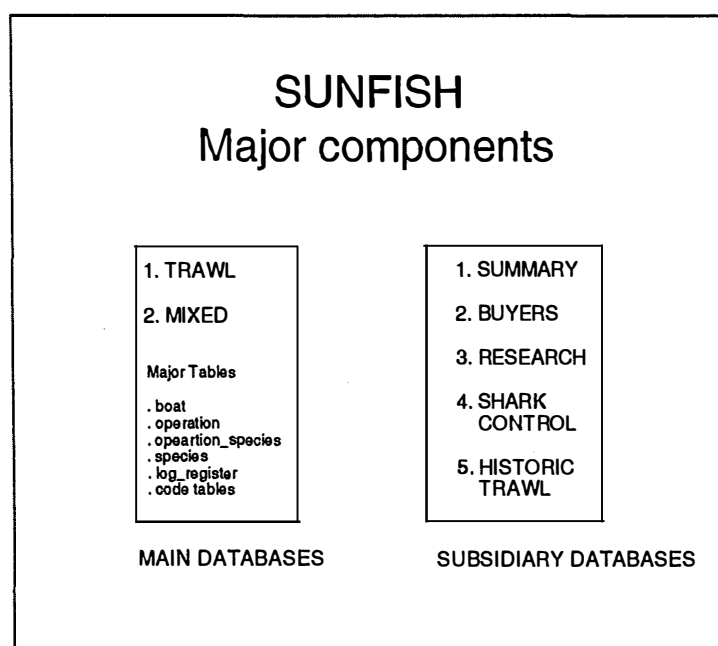


Figure 1. Major components of QFISH

The subsidiary databases contain other major databases such as the Shark Control Program, Buyer's Return etc. An important function of the subsidiary databases is to permit the storage of and access to selected data from other projects without forcing it to undergo excessive reprocessing in order to fit it into the main database.

QFISH does not currently hold licensing information on fishing vessels. Licensing details are held by the Queensland Fish Management Authority on an IBM AS400 platform. A direct

link between QFISH and the licensing database is planned for 1994.

Catch and Effort System

Introduction

The catch and effort (logbook) system contains catch and effort data on commercial fishing operations in the in Queensland managed fisheries, obtained from logbooks filled in on fishing boats. The data is checked and edited QDPI staff before storage on the QFISH data base.

A number of logbooks are in use, collecting significantly different data. The database design attempts to bring the data together into a common format, with common coding conventions and using a standardised set of units, while accommodating the differences by supplying many fields within that framework that will only be used by one or a few logbook types.

Database Structure

There are two main catch and effort databases within QFISH :

- TRAWL contains data from the East Coast Otter Trawl Fishery
- MIXED contains data from the Line, Net, and Crab fisheries, each identified by a fishery code, as defined on the *fishery* table.

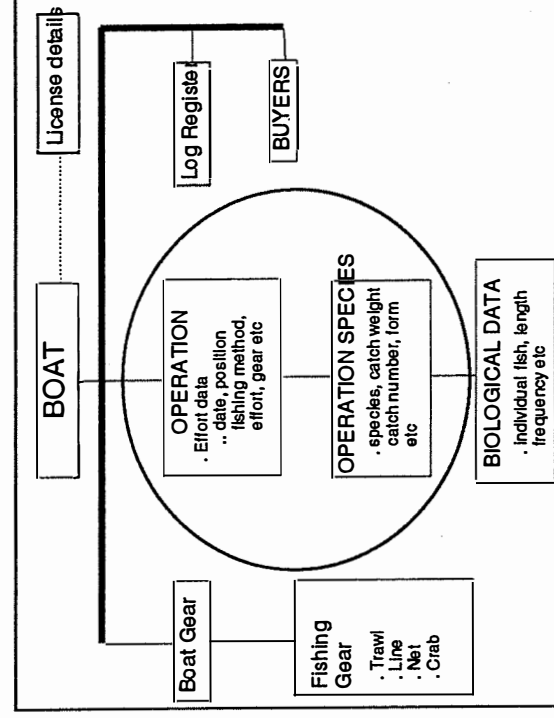


Figure 2. Schematic representation of the main table groups within the catch and effort system

Within each database, the data is contained in the tables shown schematically in Figure 2. In summary, these tables include :

- Boat - master list of boats known to the system, including details that are not dependent on the fishery or fishing method.
- Boat Gear - boat and gear data obtained from gear sheets.

/Fishing Gear

| | | |
|-------------------|---|--|
| Operation | - | details of each shot, day's fishing effort or extended non-fishing activity by a boat, |
| Operation Species | - | catch data, including species, catch weight, catch number, product form etc |
| Biological | - | biological data including individual specimens, length-frequency data, etc |
| Buyers | - | data provided from Buyers/Processors |
| Landing | - | landings by species as recorded in logbooks (not currently used on existing logbooks) |

Landing and biological data may obtained from sources other than logbooks (e.g. processor returns) is stored in separate databases.

Background notes on some of the major tables

Several tables are essential to the operation of the database. These include :

- . Boat Table
- . Log Register
- . Code tables
- . Conversion/Validation Tables

Boat Table

The main purpose of this table is provide a list of boats known to the system, and to supply selected information about those boats.

"Real world" identifiers for boats include Symbols, Licensed Fishing Boat Numbers, etc. These identifiers are unique over the time period for which they are valid, but there are no other restrictions. These identifiers are stored in the Vessel_id field. If the vessel_id is a state registration number, the state_registered field contains a state code, otherwise it is blank.

A "real world" identifier is valid between the effective_date and the terminated_date on the database. A boat's identifier is "current" if terminated_date is null. However, since the database is primarily concerned with historical data, there is no difference in the treatment of current boats as compared with boats which are no longer current. The test is always, was the boat current at the time the data was recorded, not whether the boat is current now. If a boat has more than one state registration at a given time, there will be more than one record for that boat valid at that time.

The vessel sequence number (vessel_seq_no) is a unique number assigned by the system to a boat. The boat retains this number throughout its lifetime. This number allows the history of a boat to be traced, and provides a link between multiple current registrations of the same boat.

Log Register

The log register provides the link between the paper system and the computer database. Its purpose is to record the arrival of batches of log sheets (for a specific boat over a date range) log sheets, and to assist in monitoring their progress through the data entry and validation processes. For storage purposes, these logsheets may be grouped into a file. The file name is recorded on the log register, and also on the operation record.

The information contained in the log register summarises the record-level status information in the operation record. The operations_entered field is updated as each record is inserted into the database, the operations_verified flag each time a record is verified (double-punched, i.e. when the verified_flag is set) and the operations_completed flag each time editing of a record is complete (i.e. the edited_flag is set). The log_status_flag is initially set to R (=Received), changed to V (=Verified) when operations_verified = operations_entered and to C(=Completed) when operations_completed = operations_entered.

Because of the inevitable evolution in methods of data capture and validation, it is likely that the format and use of this table will change over time.

Code Tables

In addition to the logbook data itself, there are a number of code tables, containing the values and meanings of codes used in the system. These tables are:

- activity
- bait_type
- cloud_cover
- company
- date_time_type
- engine_aspiration
- engine_cooling
- fishery
- fishing_method
- gear_damage_cause
- gear_damage_type
- length_measurement
- location_sel_method
- market
- nationality
- port
- pos_measurement
- sea_height
- search_method

sex
species
state
weight_type
wind_force

All codes are held as varchar(10) on the database. For the actual length and permissible values, the description of the relevant code table should be consulted. The Units table contains information about the units used for quantities stored on the database.

Conversion/validation tables

Two extra sets of tables are used during the entry and validation of data. These are:

- i) Conversion tables containing the conversions of logbook-specific coding into the standardised system-wide coding, e.g. 3-character species codes into the 6-digit CSIRO species codes
- ii) Validation tables containing value-ranges for tests to be applied to the data.

The conversion tables are:

cooperating_boat
fishing_ground
grade_unit
grid
log_company
log_description
log_fishing_method
log_grade
log_port
log_species
statistical_region
weight_conversion

The validation tables are:

afz_map
expected_cpue
fishery_area
species_habitat
test_value

Database Schema

Introduction

This section lists the schema for the catch and effort (logbook) component of QFISH. The following notes define the conventions used in presenting the schema :

1. Data types:

| | | |
|-----------|---|--|
| Char n | - | a character field of n characters |
| Varchar n | - | a variable length character field occupying at most n characters |
| Integer n | - | an integer occupying n bytes |
| Date | - | a field containing a date and/or a time |
| Float n | - | a floating point number occupying n bytes |

The naming convention for date fields is that a field called "_date" will contain a date only, one called "_time" will contain a date and time.

2. If nulls are not permitted in a field, the Nulls column contains No.

3. The following fields appear in a number of tables:

| | | |
|----------------|---|---|
| fishery_code | - | this is a unique code given to each fishery. Legal values are found in the Fishery table. |
| boat_record_no | - | this identifies a record for the boat in the boats table. |
| species_code | - | this is the 6-digit CSIRO species code. Different sets of codes used in different logbooks are converted to this code. |
| species_grade | - | catch is often graded by size or by market. Grade definitions are discussed in the preamble to the operation_species table. |
| log_type | - | most types of logbook are identified by a 4 character code, the first two letters of which usually indicate the fishery, and the following two digits the version number, e.g. OT02 is version 2 of the East Coast Trawl Logbook. |

4. As far as possible, the data items stored on the database are those supplied on the log. Conversions to standard coding systems (e.g. for species) and standard units (e.g. kilograms for weights) are performed where required. Derived values are not normally stored, e.g. if a log supplies start end times

for an operation, these would not be used to calculate an elapsed time, even though an appropriate field appears on the database. The exceptions are the Operation Latitude/Longitude and Effort fields (when derived from grids). These are included so that every fishing operation has a position and an effort value (if they are supplied) in a standard position, whatever the source of the information.

Schema

Table Name : activity
 Table Description : Activity codes
 Table Owner : cfishdba
 Storage Structure : ISAM
 Unique Key : Yes
 Row Width : 54
 Number Of Rows : 13

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|---------------|----------|--------|-------|---------|---------------------------------|
| 1 | activity_code | VARCHAR | 10 | No | No | code value refer activity table |
| | activity_desc | VARCHAR | 40 | No | Yes | code description |

Table Name : afz_map
 Table Description : Map of Australian coastline.
 Table Owner : cfishdba
 Storage Structure : HASH
 Unique Key : Yes
 Row Width : 10
 Number Of Rows : 19,148

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|-----------------|----------|--------|-------|---------|--------------------------------|
| | line_no | INTEGER | 2 | No | No | |
| | point_no | INTEGER | 2 | No | No | |
| | radial_distance | INTEGER | 4 | No | No | distance from centre Australia |
| | point_type | INTEGER | 2 | No | No | |

Table Name : bait_type
 Table Description : Bait type codes
 Table Owner : cfishdba
 Storage Structure : HEAP
 Unique Key : Yes
 Row Width : 54
 Number Of Rows : 3

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|----------------|----------|--------|-------|---------|-----------------------------------|
| | bait_type_code | VARCHAR | 10 | No | No | code value refer bait_type table. |
| | bait_type_desc | VARCHAR | 40 | No | Yes | code description |

Table Name : bearing
 Table Description : Conversions of compass bearings to directions from N.
 Table Owner : cfishdba
 Storage Structure : HEAP
 Unique Key : Yes
 Row Width : 16
 Number Of Rows : 8

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|-----------------|----------|--------|-------|---------|-----------------------------|
| | compass_bearing | VARCHAR | 10 | No | No | compass bearing, e.g. |
| | bearing_angle | INTEGER | 4 | No | No | angle is degrees from north |

Table Name : boat
 Table Description : Master List of Boats
 Table Owner : cfishdba
 Storage Structure : BTREE
 Unique Key : No
 Row Width : 176
 Number Of Rows : 4,345

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|------------------|----------|--------|-------|---------|--------------------------|
| 1 | boat_record_no | INTEGER | 4 | No | No | number assigned to boat. |
| | state_registered | VARCHAR | 10 | No | No | State of registration |

| | | | | | |
|-------------------|---------|----|-----|----|---------------------------------------|
| vessel_id | VARCHAR | 10 | No | No | Callsign, state |
| alternate_dist_no | VARCHAR | 10 | Yes | No | |
| effective_date | DATE | 0 | No | No | date of gear sheet |
| terminated_date | DATE | 0 | Yes | No | date of termination of record |
| nationality | VARCHAR | 10 | Yes | No | Nationality of boat. |
| boat_name | VARCHAR | 30 | Yes | No | Name of boat |
| owner_no | INTEGER | 2 | Yes | No | unique number assigned to boat owners |
| vessel_seq_no | INTEGER | 4 | Yes | No | unique number assigned to hull |
| added_time | DATE | 0 | Yes | No | record added to database. |
| added_by | VARCHAR | 12 | Yes | No | user-id of person adding data |
| changed_time | DATE | 0 | Yes | No | date of last change to record. |
| changed_by | VARCHAR | 12 | Yes | No | user-id of person making changes. |

Table Name : boat_gear
 Table Description : Data for the boat and for gear attached to the boat obtained from gear sheets.
 Table Owner : cfishdba
 Storage Structure : BTREE
 Unique Key : Yes
 Row Width : 130
 Number Of Rows : 0

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|-----------------------|----------|--------|-------|---------|-----------------------------|
| 1 | fishery_code | VARCHAR | 10 | No | No | code for fishery |
| 2 | boat_record_no | INTEGER | 4 | No | No | number assigned to boat. |
| 3 | effective_date | DATE | 0 | No | No | date of gear sheet |
| | princ_fishing_method | VARCHAR | 10 | Yes | No | main fishing method |
| | altern_fishing_method | VARCHAR | 10 | Yes | No | |
| | try_net_flag | CHAR | 1 | Yes | No | |
| | fish_hold_capacity | FLOAT | 4 | Yes | No | fish hold capacity (tonnes) |
| | catch_storage_code | VARCHAR | 10 | Yes | No | code value |
| | catch_storage_temp | FLOAT | 4 | Yes | No | catch storage temperature |
| | box_weight | FLOAT | 4 | Yes | No | capacity (kg) of containers |
| | deck_load_capacity | FLOAT | 4 | Yes | No | |
| | bait_capacity | FLOAT | 4 | Yes | No | bait capacity (tonnes) |
| | bait_scoop_weight | FLOAT | 4 | Yes | No | capacity (kg) of scoop used |
| | facsimile_flag | CHAR | 1 | Yes | No | |
| | satnav_flag | CHAR | 1 | Yes | No | |
| | temp_recorder_flag | CHAR | 1 | Yes | No | |
| | winch_drum_diam | FLOAT | 4 | Yes | No | winch drum diameter (m) |
| | winch_flange_diam | FLOAT | 4 | Yes | No | winch flange diameter (m) |
| | winch_flange_spacing | FLOAT | 4 | Yes | No | distance between winch |
| | warp_length | FLOAT | 4 | Yes | No | length of trawl warp (m) |
| | warp_diam | FLOAT | 4 | Yes | No | trawl warp diameter (mm) |

Table Name : boat_licence
 Table Description : Licence information for a boat.
 Table Owner : cfishdba
 Storage Structure : HEAP
 Unique Key : No
 Row Width : 8
 Number Of Rows : 0

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|----------------|----------|--------|-------|---------|--------------------------|
| | boat_record_no | INTEGER | 4 | Yes | No | number assigned to boat. |
| | licence_type | CHAR | 2 | Yes | No | |

Table Name : boat_owner
 Table Description : Boat owner details.
 Table Owner : cfishdba
 Storage Structure : HEAP
 Unique Key : No
 Row Width : 201
 Number Of Rows : 0

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|-------------|----------|--------|-------|---------|---------------------------------------|
| | owner_no | INTEGER | 2 | Yes | No | unique number assigned to boat owners |
| | title | VARCHAR | 5 | Yes | No | |
| | given_name | VARCHAR | 30 | Yes | No | |
| | surname | VARCHAR | 30 | Yes | No | |
| | address_1 | VARCHAR | 32 | Yes | No | |
| | address_2 | VARCHAR | 32 | Yes | No | |
| | town | VARCHAR | 30 | Yes | No | |
| | state | CHAR | 3 | Yes | No | |
| | post_code | INTEGER | 2 | Yes | No | |
| | area_code | CHAR | 3 | Yes | No | |
| | phone | VARCHAR | 7 | Yes | No | |

Table Name : cloud_cover
 Table Description : Cloud cover codes.
 Table Owner : cfishdba
 Storage Structure : HEAP
 Unique Key : Yes
 Row Width : 54
 Number Of Rows : 11

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|------------------|----------|--------|-------|---------|------------------|
| | cloud_cover_code | VARCHAR | 10 | No | No | code value |
| | cloud_cover_desc | VARCHAR | 40 | No | No | code description |

Table Name : company
 Table Description : Company codes
 Table Owner : cfishdba
 Storage Structure : CHEAP
 Unique Key : Yes
 Row Width : 54
 Number Of Rows : 436

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|--------------|----------|--------|-------|---------|--------------------------|
| | company_code | VARCHAR | 10 | No | No | Company operating flight |
| | company_desc | VARCHAR | 40 | No | No | company name |

Table Name : cooperating_boat
 Table Description : List of purse-seine boats.
 Table Owner : cfishdba
 Storage Structure : HEAP
 Unique Key : Yes
 Row Width : 68
 Number Of Rows : 0

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|-----------------------|----------|--------|-------|---------|-----------------------|
| | cooperating_boat_code | VARCHAR | 10 | No | No | code on log |
| | boat_name | VARCHAR | 30 | No | No | Name of boat |
| | vessel_id | VARCHAR | 10 | No | No | Callsign, state |
| | state_registered | VARCHAR | 10 | No | No | State of registration |

Table Name : cruise
 Table Description : Start and end dates for a cruise for a boat.
 Table Owner : cfishdba
 Storage Structure : HEAP
 Unique Key : Yes
 Row Width : 41
 Number Of Rows : 0

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|-------------------|----------|--------|-------|---------|----------------------------|
| | fishery_code | VARCHAR | 10 | No | No | code for fishery |
| | boat_record_no | INTEGER | 4 | No | No | number assigned to boat. |
| | cruise_start_date | DATE | 0 | No | No | date of cruise |
| | cruise_end_date | DATE | 0 | Yes | No | date of cruise completion. |

Table Name : date_time_type
 Table Description : Date/time type codes.
 Table Owner : cfishdba
 Storage Structure : HEAP
 Unique Key : Yes
 Row Width : 54
 Number Of Rows : 3

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|---------------------|----------|--------|-------|---------|------------------|
| | date_time_type_code | VARCHAR | 10 | No | No | |
| | date_time_type_desc | VARCHAR | 40 | No | No | code description |

Table Name : expected_cpue
 Table Description : Expected catch, effort and catch per unit effort values.
 Table Owner : cfishdba
 Storage Structure : HEAP
 Unique Key : Yes
 Row Width : 28
 Number Of Rows : 15

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|---------------------|----------|--------|-------|---------|--------------------------------|
| | fishing_method_code | VARCHAR | 10 | No | No | refer to fishing_method table. |
| | catch_max_wt | INTEGER | 4 | No | No | |
| | catch_max_nos | INTEGER | 4 | No | No | |
| | effort_min | FLOAT | 4 | No | No | lower limit of effort |
| | effort_max | FLOAT | 4 | No | No | upper limit of effort |

Table Name : fishery_area
 Table Description : Position of a fishery.
 Table Owner : cfishdba
 Storage Structure : HEAP
 Unique Key : Yes
 Row Width : 28
 Number Of Rows : 3

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|------------------------|----------|--------|-------|---------|--------------------------------|
| | fishery_code | VARCHAR | 10 | No | No | code for fishery |
| | top_left_latitude | FLOAT | 4 | No | No | latitude of northern boundary |
| | top_left_longitude | FLOAT | 4 | No | No | longitude of western |
| | bottom_right_latitude | FLOAT | 4 | No | No | latitude of southern boundary. |
| | bottom_right_longitude | FLOAT | 4 | No | No | longitude of eastern boundary. |

Table Name : fishing_ground
 Table Description : Fishing grounds.
 Table Owner : cfishdba
 Storage Structure : ISAM
 Unique Key : Yes
 Row Width : 54
 Number Of Rows : 697

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|---------------------|----------|--------|-------|---------|-----------------------------------|
| 1 | fishing_ground_code | VARCHAR | 10 | No | No | number given to a fishing ground. |
| | fishing_ground_name | VARCHAR | 40 | No | No | |

Table Name : fishing_method
 Table Description : Fishing method codes
 Table Owner : cfishdba
 Storage Structure : HEAP
 Unique Key : Yes
 Row Width : 54
 Number Of Rows : 15

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|---------------------|----------|--------|-------|---------|--------------------------------|
| | fishing_method_code | VARCHAR | 10 | No | No | refer to fishing_method table. |
| | fishing_method_desc | VARCHAR | 40 | No | Yes | code description |

Table Name : gear_damage_cause
 Table Description : Gear damage cause codes
 Table Owner : cfishdba
 Storage Structure : HEAP
 Unique Key : Yes
 Row Width : 54
 Number Of Rows : 2

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|------------------------|----------|--------|-------|---------|-----------------------|
| | gear_damage_cause_code | VARCHAR | 10 | No | No | cause of gear damage. |
| | gear_damage_cause_desc | VARCHAR | 40 | No | Yes | code description |

Table Name : gear_damage_type
 Table Description : Gear damage type codes.
 Table Owner : cfishdba
 Storage Structure : HEAP
 Unique Key : Yes
 Row Width : 54
 Number Of Rows : 6

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|-----------------------|----------|--------|-------|---------|------------------|
| | gear_damage_type_code | VARCHAR | 10 | No | No | code value |
| | gear_damage_type_desc | VARCHAR | 40 | No | No | code description |

Table Name : grade_unit
 Table Description : Grade unit codes.
 Table Owner : cfishdba
 Storage Structure : HEAP
 Unique Key : Yes
 Row Width : 54
 Number Of Rows : 4

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|-----------------|----------|--------|-------|---------|----------------------|
| | grade_unit_code | VARCHAR | 10 | No | No | code for grade units |
| | grade_unit_desc | VARCHAR | 40 | No | No | description |

Table name : grid
 Table Description : Conversions from grids to latitudes and longitudes.
 Table Owner : cfishdba
 Storage Structure : ISAM
 Unique Key : Yes
 Row Width : 46
 Number Of Rows : 31,797

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|--------------------|----------|--------|-------|---------|----------------------------------|
| 1 | grid_no | INTEGER | 2 | No | No | grid number |
| 2 | grid_reference | VARCHAR | 10 | No | No | grid reference |
| | grid_latitude | FLOAT | 4 | No | No | latitude (degrees) to be |
| | grid_longitude | FLOAT | 4 | No | No | longitude (degrees) to be used. |
| | position_precision | FLOAT | 4 | No | No | precision (degrees) of position. |
| | north_latitude | FLOAT | 4 | Yes | No | latitude of northern boundary |
| | west_longitude | FLOAT | 4 | Yes | No | longitude of western boundary |
| | south_latitude | FLOAT | 4 | Yes | No | latitude of southern boundary |
| | east_longitude | FLOAT | 4 | Yes | No | longitude of eastern boundary. |

Table Name : landing
 Table Description : Landing information obtained from logbooks or from fishing boats.
 Table Owner : cfishdba
 Storage Structure : BTREE
 Unique Key : Yes
 Row Width : 97
 Number Of Rows : 0

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|-------------------|----------|--------|-------|---------|--|
| | fishery_code | VARCHAR | 10 | No | No | code for fishery |
| 1 | boat_record_no | INTEGER | 4 | No | No | number assigned to boat. |
| 2 | landing_date | DATE | 0 | No | No | date of landing |
| | landing_no | INTEGER | 2 | No | Yes | sequential number given to a landing within a day. |
| | trip_start_date | DATE | 0 | Yes | No | date the trip started |
| | trip_end_date | DATE | 0 | Yes | No | date the trip ended |
| | port_code | VARCHAR | 10 | Yes | No | port code |
| | company_code | VARCHAR | 10 | Yes | No | Company operating flight |
| | mother_ship_no | INTEGER | 4 | Yes | No | |
| | rec_tot_wt_landed | FLOAT | 4 | Yes | No | |
| | rec_tot_no_landed | INTEGER | 4 | Yes | No | |

Table Name : landing_species
 Table Description : Species breakdown of landing information obtained from logbooks.
 Table Owner : cfishdba
 Storage Structure : HEAP
 Unique Key : Yes
 Row Width : 82
 Number Of Rows : 0

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|------------------|----------|--------|-------|---------|--|
| | fishery_code | VARCHAR | 10 | No | No | code for fishery |
| | boat_record_no | INTEGER | 4 | No | No | number assigned to boat. |
| | landing_date | DATE | 0 | No | No | date of landing |
| | landing_no | INTEGER | 2 | No | Yes | sequential number given to a landing within a day. |
| | species_code | VARCHAR | 10 | No | No | Species code (CSIRO 6-digit code) |
| | species_grade | VARCHAR | 10 | No | No | species grade |
| | landed_nos | INTEGER | 4 | Yes | No | number of fish of this species and grade landed. |
| | landed_wt | FLOAT | 4 | Yes | No | wt (kg) of fish of this species and grade landed. |
| | weight_type_code | VARCHAR | 10 | Yes | No | meaning of weight |
| | weight_factor | FLOAT | 4 | Yes | No | factor used to convert processed to whole weight |

Table Name : length_measurement
 Table Description : Length measurement codes.
 Table Owner : cfishdba
 Storage Structure : HEAP
 Unique Key : Yes
 Row Width : 54
 Number Of Rows : 4

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|-------------------------|----------|--------|-------|---------|-------------------------------|
| | length_measurement_code | VARCHAR | 10 | No | No | way in which length measured. |
| | length_measurement_desc | VARCHAR | 40 | No | No | code description. |

Table Name : licence
 Table Description : Licence types and descriptions
 Table Owner : cfishdba
 Storage Structure : HEAP
 Unique Key : No
 Row Width : 30
 Number Of Rows : 0

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|--------------|----------|--------|-------|---------|-------------|
| | licence_type | CHAR | 2 | Yes | No | |
| | licence_desc | VARCHAR | 24 | Yes | No | |

Table Name : loc_sel_method
 Table Description : Location selection method codes.
 Table Owner : cfishdba
 Storage Structure : HEAP

Unique Key : Yes
 Row Width : 54
 Number Of Rows : 7

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|---------------------|----------|--------|-------|---------|------------------|
| | loc_sel_method_code | VARCHAR | 10 | No | No | code value |
| | loc_sel_method_desc | VARCHAR | 40 | No | No | code description |

Table Name : log_company
 Table Description : Conversions of company codes.
 Table Owner : cfishdba
 Storage Structure : HEAP
 Unique Key : Yes
 Row Width : 28
 Number Of Rows : 371

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|------------------|----------|--------|-------|---------|---------------------------|
| | log_type | CHAR | 4 | No | No | code for the log type. |
| | log_company_code | VARCHAR | 10 | No | No | company code used on log. |
| | company_code | VARCHAR | 10 | No | No | Company operating flight |

Table Name : log_control
 Table Description : Control the issuing of log books
 Table Owner : cfishdba
 Storage Structure : HEAP
 Unique Key : No
 Row Width : 118
 Number Of Rows : 1,832

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|----------------|----------|--------|-------|---------|--------------------------|
| | log_type | VARCHAR | 4 | No | No | code for the log type. |
| | boat_record_no | INTEGER | 4 | No | No | number assigned to boat. |
| | old_log_no | INTEGER | 4 | Yes | No | number of old log |
| | new_log_type | VARCHAR | 4 | Yes | No | type of new log sent |
| | new_log_no | INTEGER | 4 | Yes | No | number of new log sent |
| | date_sent | DATE | 0 | Yes | No | |
| | address | VARCHAR | 60 | Yes | No | |
| | sent_by | VARCHAR | 12 | Yes | No | |

Table Name : log_description
 Table Description : Parameters for a log type.
 Table Owner : cfishdba
 Storage Structure : HEAP
 Unique Key : Yes
 Row Width : 115
 Number Of Rows : 13

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|----------------------|----------|--------|-------|---------|-----------------------------------|
| | log_type | VARCHAR | 4 | No | No | code for the log type. |
| | log_name | VARCHAR | 40 | No | No | name given to log |
| | fishery_code | VARCHAR | 10 | No | No | code for fishery |
| | grid_no | INTEGER | 2 | Yes | No | grid number |
| | fishing_method_code | VARCHAR | 10 | Yes | No | refer to fishing_method table. |
| | database_name | VARCHAR | 32 | Yes | No | |
| | verify_required_flag | CHAR | 1 | Yes | No | Y if double-punching required |
| | log_source_type_flag | CHAR | 1 | Yes | No | To be used to flag source of log. |

Table Name : log_fishing_method
 Table Description : Conversion of fishing method codes.
 Table Owner : cfishdba
 Storage Structure : HASH
 Unique Key : Yes
 Row Width : 36
 Number Of Rows : 7

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|-------------|----------|--------|-------|---------|-------------|
|-----|-------------|----------|--------|-------|---------|-------------|

| | | | | | | |
|---|---------------------|---------|----|----|----|--------------------------------|
| 1 | log_type | VARCHAR | 10 | No | No | code for the log type. |
| 2 | log_fishing_method | VARCHAR | 10 | No | No | fishing method code |
| | fishing_method_code | VARCHAR | 10 | No | No | refer to fishing_method table. |

Table Name : log_grade
 Table Description : Grade descriptions.
 Table Owner : cfishdba
 Storage Structure : HEAP
 Unique Key : Yes
 Row Width : 59
 Number Of Rows : 3

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|-----------------|----------|--------|-------|---------|-----------------------------------|
| | log_type | VARCHAR | 10 | No | No | code for the log type. |
| | species_code | VARCHAR | 10 | No | No | Species code (CSIRO 6-digit code) |
| | species_grade | VARCHAR | 10 | No | No | species grade |
| | grade_min_value | FLOAT | 4 | Yes | No | minimum of grade range |
| | grade_max_value | FLOAT | 4 | Yes | No | |
| | grade_unit_code | VARCHAR | 10 | Yes | No | code for grade units |

Table Name : log_species
 Table Description : Conversion of species codes.
 Table Owner : cfishdba
 Storage Structure : HEAP
 Unique Key : No
 Row Width : 64
 Number Of Rows : 860

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|---------------------|----------|--------|-------|---------|-----------------------------------|
| | log_type | VARCHAR | 10 | No | No | code for the log type. |
| | log_species_code | VARCHAR | 20 | No | No | species code used on log. |
| | display_sequence_no | INTEGER | 2 | Yes | No | position on displayed table. |
| | species_code | VARCHAR | 10 | No | No | Species code (CSIRO 6-digit code) |
| | species_grade | VARCHAR | 10 | Yes | No | species grade |
| | wt_or_no_flag | CHAR | 1 | Yes | No | W if code refers to weight |

Table name : market
 Table Description : Market codes.
 Table Owner : cfishdba
 Storage Structure : HEAP
 Unique Key : Yes
 Row Width : 54
 Number Of Rows : 2

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|-------------|----------|--------|-------|---------|------------------|
| | market_code | VARCHAR | 10 | No | No | code value |
| | market_desc | VARCHAR | 40 | No | Yes | code description |

Table Name : nationality
 Table Description : Nationality codes.
 Table Owner : cfishdba
 Storage Structure : HEAP
 Unique Key : Yes
 Row Width : 54
 Number Of Rows : 18

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|------------------|----------|--------|-------|---------|------------------|
| | nationality_code | VARCHAR | 10 | No | No | code value |
| | nationality_desc | VARCHAR | 40 | No | No | code description |

Table Name : operation
 Table Description : Details of a short, a day's fishing, or an extended non-fishing period.
 Table Owner : cfishdba
 Storage Structure : BTREE
 Unique Key : No
 Row Width : 394
 Number Of Rows : 594,258

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|---------------------|----------|--------|-------|---------|--|
| 1 | fishery_code | VARCHAR | 10 | No | No | code for fishery |
| 2 | boat_record_no | INTEGER | 4 | No | No | number assigned to boat. |
| 3 | operation_date | DATE | 0 | No | No | date of operation |
| 4 | operation_no | INTEGER | 2 | No | Yes | unique number given to operation within a day. |
| | end_date | DATE | 0 | No | No | date of operation. |
| | activity_code | VARCHAR | 10 | No | No | code value refer activity table |
| | cruise_id | VARCHAR | 10 | Yes | No | unique identifier for cruise. |
| | search_method_code | INTEGER | 1 | Yes | No | method used to search |
| | loc_sel_method_code | INTEGER | 1 | Yes | No | code value |
| | cooperating_boat_no | INTEGER | 4 | Yes | No | |
| | fishing_method_code | VARCHAR | 10 | Yes | No | refer to fishing_method table. |
| | operation_latitude | FLOAT | 4 | Yes | No | operation position |
| | operation_longitude | FLOAT | 4 | Yes | No | operation position |
| | search_latitude | FLOAT | 4 | Yes | No | search position |
| | search_longitude | FLOAT | 4 | Yes | No | search position |
| | position_precision | FLOAT | 4 | Yes | No | precision (degrees) of position. |
| | fishing_start_time | DATE | 0 | Yes | No | start date/time for full fishing (eg. start set) |
| | fishing_end_time | DATE | 0 | Yes | No | end date/time for full fishing (e.g. end of set) |
| | fishing_time | FLOAT | 4 | Yes | No | elapsed time (hours) for fishing operations. |
| | search_time | FLOAT | 4 | Yes | No | elapsed time (hours) for search |
| | effort | FLOAT | 4 | Yes | No | effort |
| | effort_precision | FLOAT | 4 | Yes | No | accuracy of calculated effort |
| | gear_code | INTEGER | 2 | Yes | No | code assigned to gear. |
| | net_mesh | INTEGER | 4 | Yes | No | mesh size of net |
| | net_length | INTEGER | 4 | Yes | No | |
| | pot_nos | INTEGER | 2 | Yes | No | number of pots. |
| | pot_lifts | INTEGER | 2 | Yes | No | number of pot lifts. |
| | line_nos | INTEGER | 2 | Yes | No | number of lines |
| | boat_nos | INTEGER | 2 | Yes | No | number of dories |
| | crew_nos | INTEGER | 2 | Yes | No | number of crewmen |
| | fishing_depth_avg | INTEGER | 4 | Yes | No | |
| | no_of_operations | INTEGER | 2 | Yes | No | number of operations (e.g. shots) |
| | skipper_id | INTEGER | 4 | Yes | No | unique id assigned to skipper |
| | port_code | VARCHAR | 10 | Yes | No | port code |
| | fishing_ground | VARCHAR | 10 | Yes | No | code for fishing ground |
| | search_grid | VARCHAR | 7 | Yes | No | grid reference for search |
| | start_grid | VARCHAR | 7 | Yes | No | grid reference for start |
| | end_grid | VARCHAR | 7 | Yes | No | grid reference for end of operation. |
| | orig_depth_units | CHAR | 1 | Yes | No | supplied depth units (e.g. fathoms) |
| | assumed_depth_units | CHAR | 1 | Yes | No | depth units assumed if units unknown. |
| | log_type | CHAR | 4 | Yes | No | code for the log type. |
| | log_no | INTEGER | 4 | Yes | No | logbook number |
| | page_no | INTEGER | 2 | Yes | No | log page number |
| | file_id | CHAR | 18 | Yes | No | given to source |
| | retained_wt | FLOAT | 8 | Yes | No | retained weight in kg |
| | uploaded_flag | CHAR | 1 | Yes | No | Y if record has been uploaded |
| | verified_flag | CHAR | 1 | Yes | No | Y if record has been verified |
| | edited_flag | CHAR | 1 | Yes | No | Y if record has passed all validations. |
| | completed_time | DATE | 0 | Yes | No | editing completed |
| | completed_by | CHAR | 12 | Yes | No | user-id of person "signing off" record. |
| | position_error | CHAR | 1 | Yes | No | Y if error in position. |
| | catch_error | CHAR | 1 | Yes | No | Y if error in a catch |
| | effort_error | CHAR | 1 | Yes | No | Y if error in effort or an effort-related field |
| | other_error | CHAR | 1 | Yes | No | Y if error detected in any fields |
| | added_time | DATE | 0 | Yes | No | record added to database. |
| | added_by | CHAR | 12 | Yes | No | user-id of person adding data |
| | changed_time | DATE | 0 | Yes | No | date of last change to record. |
| | changed_by | CHAR | 12 | Yes | No | user-id of person making changes. |

Table Name : operation_bait_used
 Table Description : Species breakdown for bait used in an operation.
 Table Owner : cfishdba
 Storage Structure : BTREE
 Unique Key : Yes
 Row Width : 43
 Number Of Rows : 0

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|----------------|----------|--------|-------|---------|--|
| | fishery_code | VARCHAR | 10 | No | No | code for fishery |
| 1 | boat_record_no | INTEGER | 4 | No | No | number assigned to boat. |
| 2 | operation_date | DATE | 0 | No | No | date of operation |
| 3 | operation_no | INTEGER | 2 | No | Yes | unique number given to operation within a day. |
| 4 | species_code | VARCHAR | 10 | Yes | No | Species code (CSIRO 6-digit code) |

Table Name : operation_catch_subtotal
 Table Description : Catch information breakdowns other than by species and grade.
 Table Owner : cfishdba
 Storage Structure : BTREE
 Unique Key : Yes
 Row Width : 79
 Number Of Rows : 0

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|---------------------|----------|--------|-------|---------|--|
| | fishery_code | VARCHAR | 10 | No | No | code for fishery |
| 1 | boat_record_no | INTEGER | 4 | No | No | number assigned to boat. |
| 2 | operation_date | DATE | 0 | No | No | date of operation |
| 3 | operation_no | INTEGER | 2 | No | Yes | unique number given to operation within a day. |
| 4 | category_name | CHAR | 10 | No | No | category |
| 5 | category_value | CHAR | 8 | No | No | cell |
| | fishing_method_code | VARCHAR | 10 | Yes | No | refer to fishing_method table. |
| | effort | FLOAT | 4 | Yes | No | effort |
| | catch_nos | INTEGER | 4 | Yes | No | number of fish of this category. |
| | catch_wt | FLOAT | 4 | Yes | No | wt (kg) of fish of this |
| | catch_percent | INTEGER | 2 | Yes | No | percentage of fish of this category |

Table Name : operation_comment
 Table Description : Comments appearing on log.
 Table Owner : cfishdba
 Storage Structure : BTREE
 Unique Key : Yes
 Row Width : 97
 Number Of Rows : 0

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|----------------|----------|--------|-------|---------|--|
| | fishery_code | VARCHAR | 10 | No | No | code for fishery |
| 1 | boat_record_no | INTEGER | 4 | No | No | number assigned to boat. |
| 2 | operation_date | DATE | 0 | No | No | date of operation |
| 3 | operation_no | INTEGER | 2 | No | Yes | unique number given to operation within a day. |
| 4 | line_no | INTEGER | 4 | No | No | |
| | comment_line | VARCHAR | 60 | Yes | No | text of comment line |

Table Name : operation_extra_data
 Table Description : Extension of operation record.
 Table Owner : cfishdba
 Storage Structure : HEAP
 Unique Key : Yes
 Row Width : 132
 Number Of Rows : 0

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|------------------------|----------|--------|-------|---------|--|
| | fishery_code | VARCHAR | 10 | No | No | code for fishery |
| | boat_record_no | INTEGER | 4 | No | No | number assigned to boat. |
| | operation_date | DATE | 0 | No | No | date of operation |
| | operation_no | INTEGER | 2 | No | Yes | unique number given to operation within a day. |
| | start_pos_measure_code | VARCHAR | 10 | Yes | No | position |
| | end_pos_measure_code | VARCHAR | 10 | Yes | No | position |
| | swell_direction | INTEGER | 2 | Yes | No | |
| | bottom_depth_initial | INTEGER | 4 | Yes | No | |
| | bottom_depth_final | INTEGER | 4 | Yes | No | |
| | temp_at_250m | FLOAT | 4 | Yes | No | temperature at depth of 250m |
| | net_temp_min | FLOAT | 4 | Yes | No | minimum net temperature |
| | net_temp_max | FLOAT | 4 | Yes | No | maximum net temperature |
| | net_temp_std_dev | FLOAT | 4 | Yes | No | standard deviation f net |
| | turbidity | FLOAT | 4 | Yes | No | turbidity in ntu |
| | thermocline_min_depth | INTEGER | 4 | Yes | No | |
| | thermocline_max_depth | INTEGER | 4 | Yes | No | |
| | surface_salinity | FLOAT | 4 | Yes | No | surface salinity (%) |
| | fishing_depth_min | INTEGER | 4 | Yes | No | |
| | fishing_depth_max | INTEGER | 4 | Yes | No | |
| | fishing_depth_std_dev | FLOAT | 4 | Yes | No | standard deviation of fishing depth. |
| | sample_percent | INTEGER | 2 | Yes | No | percent of population |
| | sample_wt | FLOAT | 4 | Yes | No | weight of sample |

Table Name : operation_species
 Table Description : Species breakdown of catch information.

Table Owner : cfishdba
 Storage Structure : BTREE
 Unique Key : No
 Row Width : 95
 Number Of Rows : 1,357,376

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|-----------------------|----------|--------|-------|---------|--|
| 1 | fishery_code | VARCHAR | 10 | No | No | code for fishery |
| 2 | boat_record_no | INTEGER | 4 | No | No | number assigned to boat. |
| 3 | operation_date | DATE | 0 | No | No | date of operation |
| 4 | operation_no | INTEGER | 2 | No | Yes | unique number given to operation within a day. |
| 5 | species_code | VARCHAR | 10 | No | No | Species code (CSIRO 6-digit code) |
| 6 | species_grade | CHAR | 10 | No | No | species grade |
| | catch_nos | FLOAT | 4 | Yes | No | number of fish of this category. |
| | catch_wt | FLOAT | 4 | Yes | No | wt (kg) of fish of this |
| | estimated_flag | CHAR | 1 | Yes | No | Y if estimated weights or N otherwise. |
| | sample_flag | CHAR | 1 | Yes | No | Y if data is a sample, N otherwise |
| | weight_type_code | VARCHAR | 10 | Yes | No | meaning of weight |
| | weight_factor | FLOAT | 4 | Yes | No | factor used to convert processed to whole weight |
| | catch_avg_wt | FLOAT | 4 | Yes | No | average weight of fish of this species and grade |
| | target_flag | CHAR | 1 | Yes | No | |
| | presence_flag | CHAR | 1 | Yes | No | Y is species was present |
| | commercial_catch_flag | CHAR | 1 | Yes | No | Y if grade is commercial and N if not. |

Table Name : operation_specimen
 Table Description : Details of individual fish caught in an operation.
 Table Owner : cfishdba
 Storage Structure : BTREE
 Unique Key : Yes
 Row Width : 108
 Number Of Rows : 0

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|-------------------------|----------|--------|-------|---------|--|
| | fishery_code | VARCHAR | 10 | No | No | code for fishery |
| 1 | boat_record_no | INTEGER | 4 | No | No | number assigned to boat. |
| 2 | operation_date | DATE | 0 | No | No | date of operation |
| 3 | operation_no | INTEGER | 2 | No | Yes | unique number given to operation within a day. |
| 4 | species_code | VARCHAR | 10 | No | No | Species code (CSIRO 6-digit code) |
| 5 | sex_code | VARCHAR | 10 | No | No | code value |
| | fish_no | CHAR | 5 | No | No | unique number to identify a fish. |
| | fish_wt | FLOAT | 4 | Yes | No | weight of fish (kg) |
| | fish_length | FLOAT | 4 | Yes | No | length of fish (m) |
| | length_measurement_code | VARCHAR | 10 | Yes | No | way in which length measured. |
| | weight_type_code | VARCHAR | 10 | Yes | No | meaning of weight |
| | market_code | VARCHAR | 10 | Yes | No | code value |

Table Name : port
 Table Description : Port codes.
 Table Owner : cfishdba
 Storage Structure : ISAM
 Unique Key : Yes
 Row Width : 54
 Number Of Rows : 350

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|-------------|----------|--------|-------|---------|-------------|
| 1 | port_code | VARCHAR | 10 | No | No | port code |
| | port_desc | VARCHAR | 40 | No | No | port name |

Table Name : pos_measurement
 Table Description : Position measurement methods.
 Table Owner : cfishdba
 Storage Structure : HEAP
 Unique Key : Yes
 Row Width : 55
 Number Of Rows : 2

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|----------------------|----------|--------|-------|---------|------------------|
| | pos_measurement_code | VARCHAR | 10 | No | No | code value |
| | pos_measurement_desc | VARCHAR | 40 | Yes | No | code description |

Table Name : sea_height
 Table Description : Sea height codes.
 Table Owner : cfishdba
 Storage Structure : HEAP
 Unique Key : Yes
 Row Width : 54
 Number Of Rows : 11

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|-----------------|----------|--------|-------|---------|------------------|
| | sea_height_code | VARCHAR | 10 | No | No | code value |
| | sea_height_desc | VARCHAR | 40 | No | No | code description |

Table Name : search_method
 Table Description : Search method codes.
 Table Owner : cfishdba
 Storage Structure : HEAP
 Unique Key : Yes
 Row Width : 54
 Number Of Rows : 5

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|--------------------|----------|--------|-------|---------|-----------------------|
| | search_method_code | VARCHAR | 10 | No | No | method used to search |
| | search_method_desc | VARCHAR | 40 | No | No | code description |

Table Name : sex
 Table Description : Sex codes.
 Table Owner : cfishdba
 Storage Structure : HEAP
 Unique Key : Yes
 Row Width : 54
 Number Of Rows : 4

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|-------------|----------|--------|-------|---------|------------------|
| | sex_code | VARCHAR | 10 | No | No | code value |
| | sex_desc | VARCHAR | 40 | No | No | code description |

Table Name : shell_dump
 Table Description : Record of pearl shell dumps.
 Table Owner : cfishdba
 Storage Structure : HEAP
 Unique Key : Yes
 Row Width : 48
 Number Of Rows : 0

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|----------------------|----------|--------|-------|---------|--------------------------|
| | fishery_code | VARCHAR | 10 | No | No | code for fishery |
| | boat_record_no | INTEGER | 4 | No | No | number assigned to boat. |
| | landing_date | DATE | 0 | No | No | date of landing |
| | total_shells_dumped | INTEGER | 4 | Yes | No | |
| | live_shell_recovered | INTEGER | 4 | Yes | No | |
| | dead_shell_recovered | INTEGER | 4 | Yes | No | |
| | period_on_dump | INTEGER | 4 | Yes | No | |

Table Name : species
 Table Description : Species codes
 Table Owner : cfishdba
 Storage Structure : HASH
 Unique Key : No
 Row Width : 88
 Number Of Rows : 3,529

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|--------------|----------|--------|-------|---------|-----------------------------------|
| 1 | species_code | VARCHAR | 10 | No | No | Species code (CSIRO 6-digit code) |

| | | | | | | |
|---|---------------------|---------|----|-----|----|-------------------------|
| | common_name | VARCHAR | 30 | No | No | common name for species |
| | species_name | VARCHAR | 40 | No | No | biological name |
| 2 | preferred_name_flag | CHAR | 1 | Yes | No | |

Table Name : species_habitat
 Table Description : Location at which species occur.
 Table Owner : cfishdba
 Storage Structure : HEAP
 Unique Key : Yes
 Row Width : 20
 Number Of Rows : 3

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|--------------|----------|--------|-------|---------|-----------------------------------|
| | species_code | VARCHAR | 10 | No | No | Species code (CSIRO 6-digit code) |
| | latitude_max | FLOAT | 4 | No | No | highest latitude where |

Table Name : state
 Table Description : State codes.
 Table Owner : cfishdba
 Storage Structure : HEAP
 Unique Key : Yes
 Row Width : 54
 Number Of Rows : 8

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|-------------|----------|--------|-------|---------|------------------|
| | state_code | VARCHAR | 10 | No | No | code value |
| | state_desc | VARCHAR | 40 | No | No | code description |

Table Name : statistical_region
 Table Description : Statistical regions for analysis of data.
 Table Owner : cfishdba
 Storage Structure : HEAP
 Unique Key : No
 Row Width : 66
 Number Of Rows : 127

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|---------------------|----------|--------|-------|---------|--------------------------------|
| | region_set_name | VARCHAR | 10 | Yes | No | name of the region set |
| | region_name | VARCHAR | 20 | Yes | No | region name |
| | west_longitude | FLOAT | 4 | Yes | No | longitude of western boundary |
| | east_longitude | FLOAT | 4 | Yes | No | longitude of eastern boundary. |
| | north_west_latitude | FLOAT | 4 | Yes | No | start of north boundary |
| | north_east_latitude | FLOAT | 4 | Yes | No | end of north boundary |
| | south_west_latitude | FLOAT | 4 | Yes | No | start of south boundary |
| | south_east_latitude | FLOAT | 4 | Yes | No | end of south boundary |

Table Name : test_value
 Table Description : Value ranges and tolerances for tests
 Table Owner : cfishdba
 Storage Structure : ISAM
 Unique Key : Yes
 Row Width : 54
 Number Of Rows : 14

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|----------------|----------|--------|-------|---------|----------------------------------|
| 1 | test_no | INTEGER | 4 | No | No | |
| 2 | test_variable | VARCHAR | 24 | No | No | name of the variable to test |
| | test_min_value | FLOAT | 8 | No | No | allowable minimum value of test |
| | test_max_value | FLOAT | 8 | No | No | allowable maximum value |
| | test_tolerance | FLOAT | 8 | No | No | allowable tolerance (%) for test |

Table Name : units
 Table Description : Units used for all quantities in the database.
 Table Owner : cfishdba

Storage Structure : HEAP
 Unique Key : Yes
 Row Width : 148
 Number Of Rows : 25

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|-------------|----------|--------|-------|---------|-------------|
| | field_name | VARCHAR | 24 | No | No | field name |
| | units | VARCHAR | 120 | No | No | units used |

Table Name : weight_conversion
 Table Description : Conversion factors between processed and whole weights.
 Table Owner : cfishdba
 Storage Structure : HEAP
 Unique Key : Yes
 Row Width : 28
 Number Of Rows : 2

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|------------------|----------|--------|-------|---------|--|
| | species_code | VARCHAR | 10 | No | No | Species code (CSIRO 6-digit code) |
| | weight_type_code | VARCHAR | 10 | No | No | meaning of weight |
| | weight_factor | FLOAT | 4 | No | No | factor used to convert processed to whole weight |

Table Name : weight_type
 Table Description : Weight type codes.
 Table Owner : cfishdba
 Storage Structure : HEAP
 Unique Key : Yes
 Row Width : 54
 Number Of Rows : 2

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|------------------|----------|--------|-------|---------|-------------------|
| | weight_type_code | VARCHAR | 10 | No | No | meaning of weight |
| | weight_type_desc | VARCHAR | 40 | No | No | code description |

Table Name : wind_force
 Table Description : Wind force codes.
 Table Owner : cfishdba
 Storage Structure : HEAP
 Unique Key : Yes
 Row Width : 54
 Number Of Rows : 14

| Key | Column Name | Datatype | Length | Nulls | Default | Description |
|-----|-----------------|----------|--------|-------|---------|------------------|
| | wind_force_code | VARCHAR | 10 | No | No | code value |
| | wind_force_desc | VARCHAR | 40 | No | No | code description |

Appendix A: Tests

Classification of Tests

Errors are classified into groups according to the type of field affected. The error number indicates the group. These groups are:

| | |
|---------|--------------------|
| 0-99 | Integrity errors |
| 100-199 | Position errors |
| 200-200 | Effort errors |
| 300-399 | Catch errors |
| 400-499 | Landing errors |
| 500-599 | Environment errors |
| 600-699 | Other errors |

Tests in the 600 range are, in general, table lookups which apply to a variety of fields or tables. Where possible, tests are conducted using this type of facility rather than more specific coding, as this allows the test criteria to be stored on the database where they are readily interrogated. Where a message refers to allowable values or tolerances, these are to be found on a TEST_VALUE table:

| | |
|------------|--|
| Test_value | { Test_no,field_name,test_min_value, test_max_value,test_tolerance } |
|------------|--|

The field name may be a database field (e.g. surface_temperature) or it may be a calculated field (e.g. average_speed). These are independent of log type, although fields could be named differently on different logs, thus generating distinct tests.

In addition, there is an *error type* indicator which specifies the action to be taken on encountering the error. The values are:

| | | |
|-------------------------|---|--|
| Key Error | - | An invalid or duplicate key value has been encountered. The record cannot be saved until the error is corrected |
| Data Entry Error | - | Invalid data type or value entered. The record cannot be saved until the error is corrected |
| Warning | - | This is an indication by the system of a potential problem. An error message is displayed, requesting further action, but the user may ignore it. In some situations, an error flag may be set |
| Position Error | - | Set Position Error Flag |
| Effort Error | - | Set Effort Error Flag |
| Catch Error | - | Set Catch Error Flag |
| Other Error | - | Set Other Error Flag |

- . The position error flag indicates that there is a possible error in the operating position.
- . The effort error flag indicates that there is a possible error in the effort field.
- . The catch error flag indicates that there is a possible error in the catch species or quantities.
- . The other error flag indicates any other potential error. Where a field is required to be present (not null) for a particular logbook type and it is not present, this constitutes an error.

Where a warning has been combined with another action, this means that a warning should be displayed at the data entry stage, but if the operator does not take remedial action, the further indicated action should be taken. Key, Data Entry and Warning tests are performed at the lowest edit level (1=data entry), and all tests except the longitudinal tests 421 and 422 are performed at the next edit level (2=edit). The longitudinal tests are invoked using the Report menu option.

Lists of Tests

0-99 Integrity and Data Type Errors

These errors would result in data which violates the basic database integrity requirements, e.g. invalid key values, duplicate records, and wrong data types (e.g. alphabetic characters in numeric fields). **They must be corrected before the record can be stored.**

1. a) Vessel not found
Reason: Vessel id/state code combination does not appear on BOATS table at all
- b) Vessel not currently registered
Reason: Vessel id/state code combination appears on BOATS table but operation date is before date effective or after termination date.
Error Type: Key error

2. Duplicate record
Reason: A record for these values of Fishery, Boat_record_no, Operation_Date and Operation_No is already on the database.
Error Type: Key error
3. Invalid date
Reason: Date entered is not a valid date
Error type: Data entry error
4. Operation Date is in Future
Reason: Operation date is later than today's date
Error type: Data entry error
5. Unexpected record order
Reason: There is a gap between this operation and the previous operation for the same boat (i.e. there is a gap in dates or in operation numbers).
Error type: Warning, Other error
6. Non-fishing operation must be only one for day
Reason: The operation number is greater than 1, but a non-fishing activity code has been supplied. This may indicate an error in the date or the activity code.,
Error type: Warning, Effort error
7. Already non-fishing operation for the day
Reason: The operation number is greater than 1, but an earlier record had a non-fishing activity code. This may indicate an error in the date.
Error type: Warning, Effort error
8. Invalid Time
Reason: Time is not in range 0000-2359 or Minutes in time exceed 59
Error type: Data entry error
9. Log not registered
Reason: There is no LOG_REGISTER record corresponding to this Fishery and Boat_record_no on which the first and last dates contain the operation date. This may indicate an error in the vessel id.
Error type: Warning
21. No box weight for catch

Reason: Catch quantities for this log type are supplied as boxes, but there is no box weight on the operation record or on the BOAT_GEAR table. If any catch is present on the record, the record cannot be saved since the necessary conversions cannot take place.

Error type: Warning, Catch error

41. Duplicate specimen record

Reason: A record for these values of Fishery, Boat_record_no, Operation_date, Operation_No, Species_Code, Sex_Code and Fish_no is already on the database

Error type: Key error

100-199 Position Errors

These errors concern the position fields.

101. Invalid latitude

Reason: Latitude given was greater than 90 degrees or minutes in latitude exceeded 59

Error type: Data entry

102. Invalid longitude

Reason: Longitude given was greater than 180 degrees or minutes in longitude exceeded 59

Error type: Data entry error

103. Different position conventions used

Reason: One position used a grid, the other latitudes and longitudes. This often occurs because a latitude or longitude is mistyped and includes an alphabetic character

Error type: Warning, other error

104. Invalid grid reference

Reason: The grid reference used was not found on the GRIDS table. This often occurs either because a grid reference was mistyped, or because a latitude or longitude was mistyped and includes an alphabetic character

Error type: Warning, Position error

105. Position not within grid

Reason: Both a grid reference (or a fishing ground, eg. NP07 log) and a latitude/longitude were supplied. The two are consistent in that the latitude/longitude do not fall within the grid square. This often occurs because either the grid reference was mistyped, or one of the latitude or longitude was mistyped.

Error type: Warning, Position/other error

111. Position not in waters off Queensland

Reason: Check with QLD Map gives position on land, or in waters outside QLD waters

Error type: Position/other Error

112. Position not within Fishery

Reason: Position is not within one of the rectangles defining the fishery in the FISHERY_AREA table

Error type: Position/other error

121. (a) Apparent speed is zero

Reason: Distance between start and finish positions is zero. (NB: Do not apply if positions are given as the same grid reference)

Error type: Position error

(b) Apparent speed is too high

Reason: Speed calculated from start and finish positions and fishing time exceeds a reasonable speed for the boat

Error type: Position error

122. Position too far from previous operation

Reason: The speed required to travel from the position of the previous operation to that of the current operation is excessive

Error type: Position error

123. (a) Recorded speed is too high

Reason: Speed recorded on logbook difference from reasonable speeds for boat

(b) Recorded speed is zero

Reason: Speed recorded on logbook is zero

Error type: Position error

124. Recorded speed is too far from actual

Reason: Speed recorded on logbook differs from calculated speed (from positions and times) by an excessive margin

Error type: Position error

200-299 Effort Errors

These errors encompass errors in fishing method, gear, activity, and times, which may reflect on the reliability of the stated or calculated effort.

201 Activity code not known

Reason: The activity code is not on the list of legal codes for the log.

Error type: Effort error

203 Gear code not defined for boat

Reason: A gear code (e.g. net code) has been supplied but the value is not defined on the boat's current gear data

205. Fishing method not allowed for boat

Reason: The supplied fishing method is not one of those listed for the boat on the Boat Gear table.

211. Trawl validity code not Y or N

Reason: Code typed in is wrong

Error type: Warning, effort error

212. Line patrolled flag not Y or N

Reason: Code typed in is wrong

Error type: Warning, other error

213. Handline indicator not H, L or blank

Reason: Code typed in is wrong

Error type: Warning, effort error

221. Date is too far from operation date

Reason: a date, other than the operation date, differs from the operation date by more than an allowable tolerance

Error type: Warning, effort error

234. Effort wrong for fishing method

Reason: The effort is outside the acceptable bounds for the given fishing method, using EXPECTED-CPUE table

Error type: Effort error

235. Effort and catch wt codes inconsistent

Reason: The code given for total catch weight corresponds to a different fishing method from that given for effort

236. Effort and catch numbers codes inconsistent

Reason: The code given for total catch numbers corresponds to a different fishing method from that given for effort

300-399 Catch Errors

These errors cover species codes and catch weights and numbers.

302. Species outside normal range

Reason: Catch for a species has been indicated at a position which is outside its normal habitat, as specified on the SPECIES_HABITAT table. This may indicate a miskeying of the species code.

Error type: Catch error

303. Target code not T,Y,N or blank

Reason: The target code typed in is wrong.

Error type: Warning, catch error

304. More than one catch wt code

Reason: more than one of the total catch weight codes (BT,GT,HT,LT PT,ST,TT) has been supplied

Action: The additional code and quantity are stored as if they were species information. This will generate an illegal species code message

305. More than one catch nos code

Reason: more than one of the total catch weight codes (HN,LN) has been supplied

Action: The additional code and quantity are stored as if they were species information. This will generate an illegal species code message

306. Weight flag not A,B,C or D

Reason: weight flag is wrong

Error type: Warning, catch error

311. (a) Weight but no numbers supplied
 (b) Numbers but no weight supplied

Reason: The logbook requires that both numbers and weights be supplied for catch for a species. One has been supplied but not the other.

Error type: Warning, catch error

312. Catch average weight outside limits

Reason: The average catch weight for a given species is outside the limits specified in EXPECTED_AVERAGE_WEIGHT

Error type: Catch error

321. Fish nos not equal to sum over species

Reason: The recorded number of fish does not equal the sum over species, with tolerance as given in the LOG_TESTS table

Error type: Catch error

322. Fish wt not equal to sum over species

Reason: The recorded total weight of fish does not equal the sum over species, with tolerance as given in the LOG_TESTS table

Error type: Catch error

323. No of fish exceeds total weight of fish

Reason: Either the recorded total no of fish retained is greater than the recorded total weight retained, or the calculated values (from species breakdown of catch) suffer from the same problem.

Error type: Catch error

324. (a) Retained wt exceeds total haul

Reason: the retained weight of fish exceeds the recorded total haul.

- (b) Discards exceeds total haul

Reason: The weight of discards exceeds the total haul

- (c) Haul not sum of wt retain, discards etc,

Reason: The recorded retained weight, discards and rubbish do not add up to the recorded haul within the tolerance given on LOG_TESTS

Error type: Catch error

331. Catch wt wrong for fishing method

Reason: The catch weight is outside the acceptable bounds for the given fishing method, using EXPECTED_CPUE table

Error type: Catch error

332. Catch nos wrong for fishing method

Reason: The catch numbers are outside the acceptable bounds for the given fishing method, using EXPECTED_CPUE table

Error type: Catch error

333. Catch per unit effort wrong for fishing method

Reason: The catch per unit effort is outside the acceptable bounds for the given fishing method, using EXPECTED_CPUE table

Error type: Catch error, Effort error

400-499 Landing Errors

These errors include both landings, and longitudinal checks of catch against landings. Note that test 301 (validity of species codes) also applies to landings.

401. Landing for vessel exists on this date

Reason: There has already been a landing for this boat on this date

Action: The default landing number is 1. Increment the landing number to obtain a unique value for the day.

Error type: Warning

402. Duplicate landing record

Reason: There is already a landing record for this date and landing number. This can be used instead of test 401 if duplicate landings on a day are to be forbidden

Error type: Key error

421. Catch differs from wt landed

Reason: The catch weight for a given species since the last landing differs from the landed weight by more than the tolerance allowed

Error type: Catch error

422. Catch differs from nos landed

Reason: the catch numbers for a given species since the last landing differ from the landed numbers by more than the tolerance allowed.

Error type: Catch error

500-599 Environment Errors

These errors cover all features of the environment in which the operation takes place, including depth information, sea, wind and cloud data.

511. (a) Max bottom depth is less than min depth

Reason: Maximum depth as supplied on logbook is less than minimum depth given

(b) Fishing depth as supplied on logbook is greater than bottom depth supplied.

Error type: Other error

512. (a) Depth units not M or F

Reason: Code typed in must be M (metres) or F (Fathoms)

(b) Blank depth units taken as F

Reason: Code typed in is blank

Action: Treat blank as fathoms and convert accordingly. Store appropriate values in *orig_depth_units* and *assumed_depth_units*

Error type: Warning, other error

521. *fieldname* is in Fahrenheit

Reason: The supplied temperature is more than 40 degrees

Action: Convert to celsius. Store supplied value in *Orig_surface_temp*

600-699 Other Errors

These tests involve lookups of supplied fields on code or conversion tables, the checking of values and ranges of supplied or calculated fields using the Test Values table, the checks for nulls or mandatory fields. The contents of the test values table are listed in the next section.

601. *field name* value not on *code table name*

Reason: The value in *field name* is not on the specified code table

602. *field name* value not on *conversion table name*

Reason: The value in *field name* is not on the specified conversion table. This can occur either in the initial conversions or on converting back for redisplay. The convention is that, if the conversion fails, the unconverted value is stored on the database, to allow regeneration of this message on redisplay

603. *field name* value out of range (*min value - max value*)

Reason: The value in *field name* is outside the allowable range specified in the field values table

604. *field name* value too far from previous operation

Reason: The value in *field name* differs too much from that in the previous operation, either in absolute value or in tolerance, based on the values given in the field differences table

610 *field name* required

Reason: *field name* has not been entered, or is null on the database record

611. *field name* must not be present

Reason: *field name* is on the database record although it is not required.

| Test No | Field Name | Min Value | Max Value | Tolerance (%) |
|---------|----------------------|-----------|-----------|---------------|
| 603 | Search_Time | 0 | 24 | |
| 603 | Fishing_Time | 0 | 24 | |
| 603 | Baiting_Time | 0 | 24 | |
| 603 | Elapsed_engine_hours | 0 | 24 | |
| 603 | Surface_temp | 10 | 35 | |
| 603 | Net_temp | 5 | 35 | |
| 603 | Bottom_temp | 5 | 35 | |
| 603 | Current_direction | 0 | 359 | |
| 603 | Wind_direction | 0 | 359 | |
| 603 | Hooks_per_float | 0 | 30 | |
| 603 | No_of_hooks | 100 | 3000 | |
| 604 | Surface_temp | -1.5 | 1.5 | 5 |
| 604 | Net_temp | -1.5 | 1.5 | 5 |
| 604 | Bottom_temp | -1.5 | 1.5 | 5 |

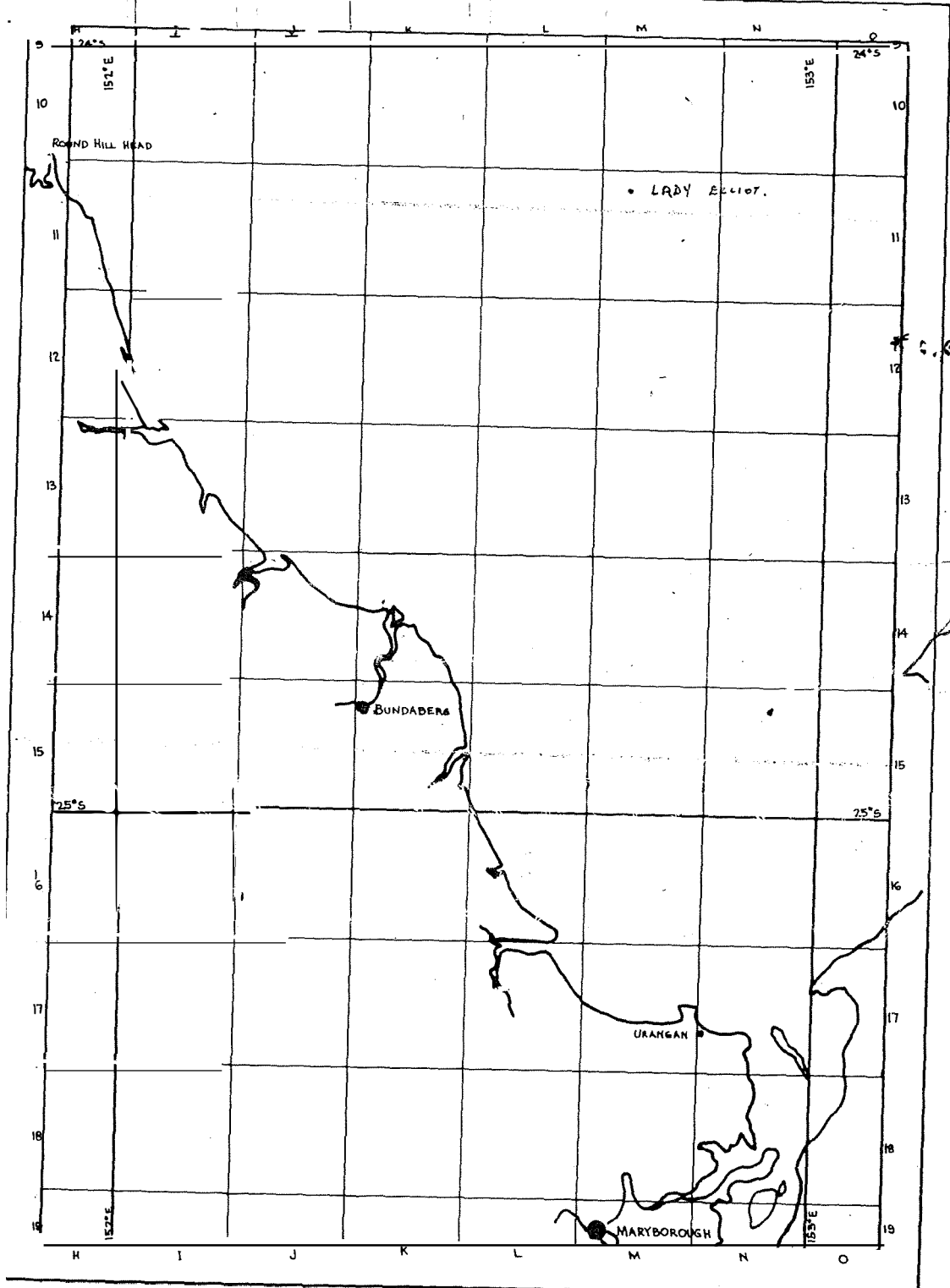
Attachment 2 List of validation checks

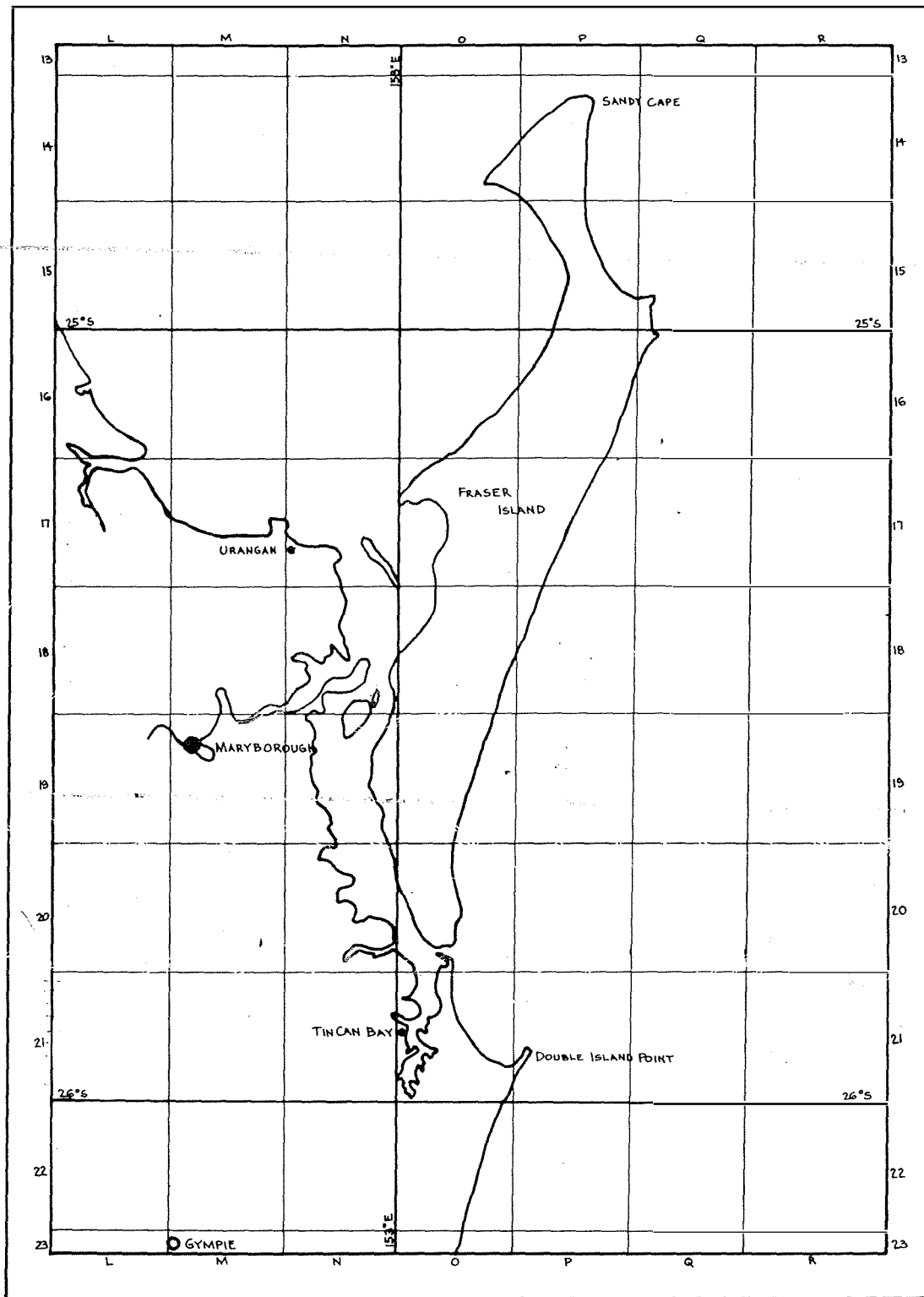
"QLD. SOUTH-EAST COAST"

HOSKINS

LADY MUSGRAVE.

B.H.





ORIGINAL

QUEENSLAND FISHERIES SERVICE
FISHERMAN'S DAILY LOG

No 9598

DATE.....VESSEL.....PORT.....SKIPPER.....

No. of SHOTS.....
AND

TOTAL LANDED WT.

FOR ENTIRE TRIP:—SCALLOP MEAT.....lb., KING/TIGER.....lb., BANANA.....lb., OTHER.....lb.

| SHOT No. | TIME* STARTED | DURATION | MAP GRID REFERENCE | DEPTH (Fathoms) | SCALLOPS (Basket) | CATCH WEIGHT (lb.) | | | NOTES ON GEAR DAMAGE, TAGS, TRASH, ETC. |
|----------|---------------|----------|--------------------|-----------------|-------------------|--------------------|--------|------------------|---|
| | | | | | | KING/TIGER | BANANA | OTHERS (Specify) | |
| 1 | | | | | | | | | |
| 2 | | | | | | | | | |
| 3 | | | | | | | | | |
| 4 | | | | | | | | | |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |
| 11 | | | | | | | | | |
| 12 | | | | | | | | | |

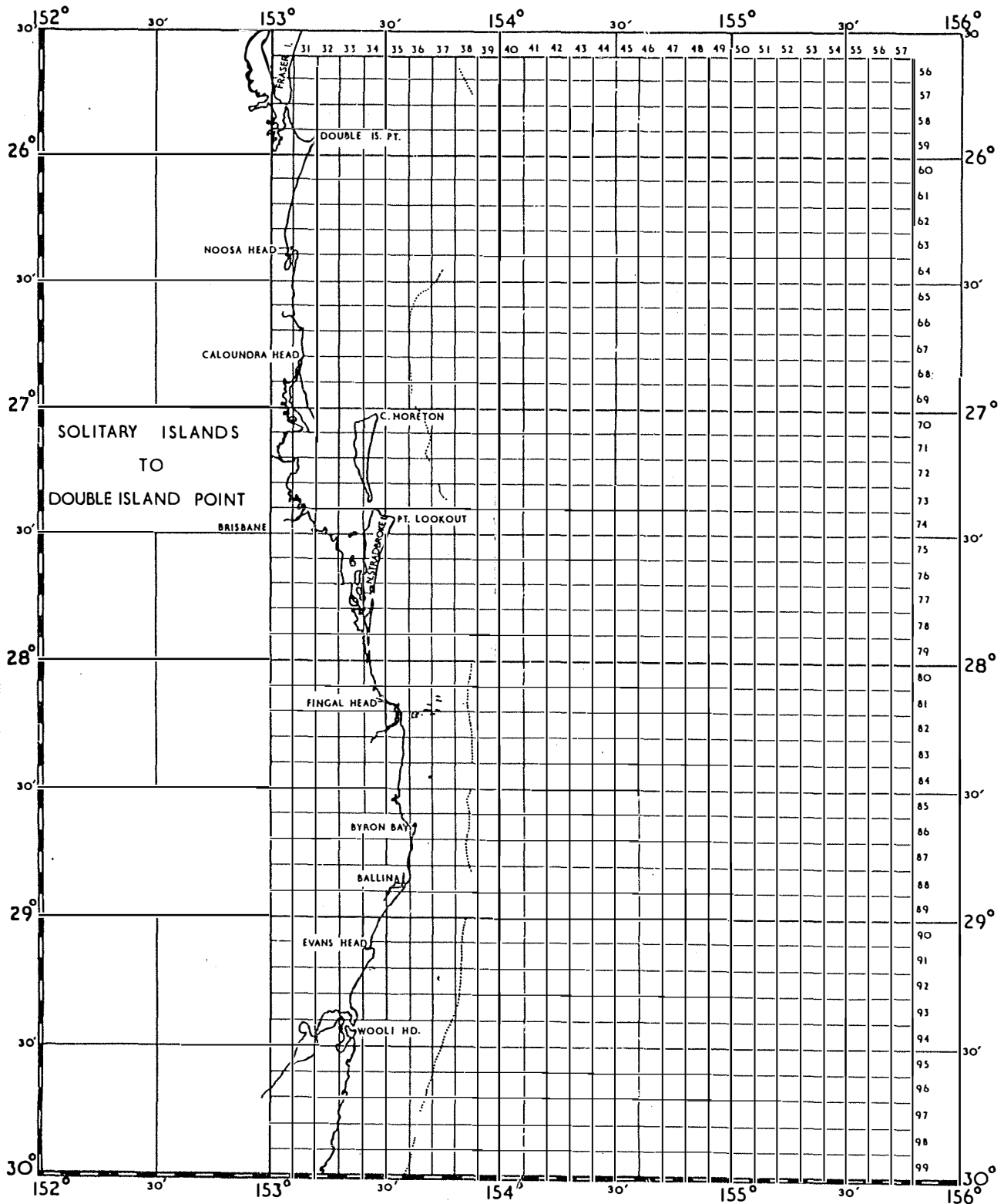
* Use 24 hour clock system. Start a new page at 0700.

REMARKS:

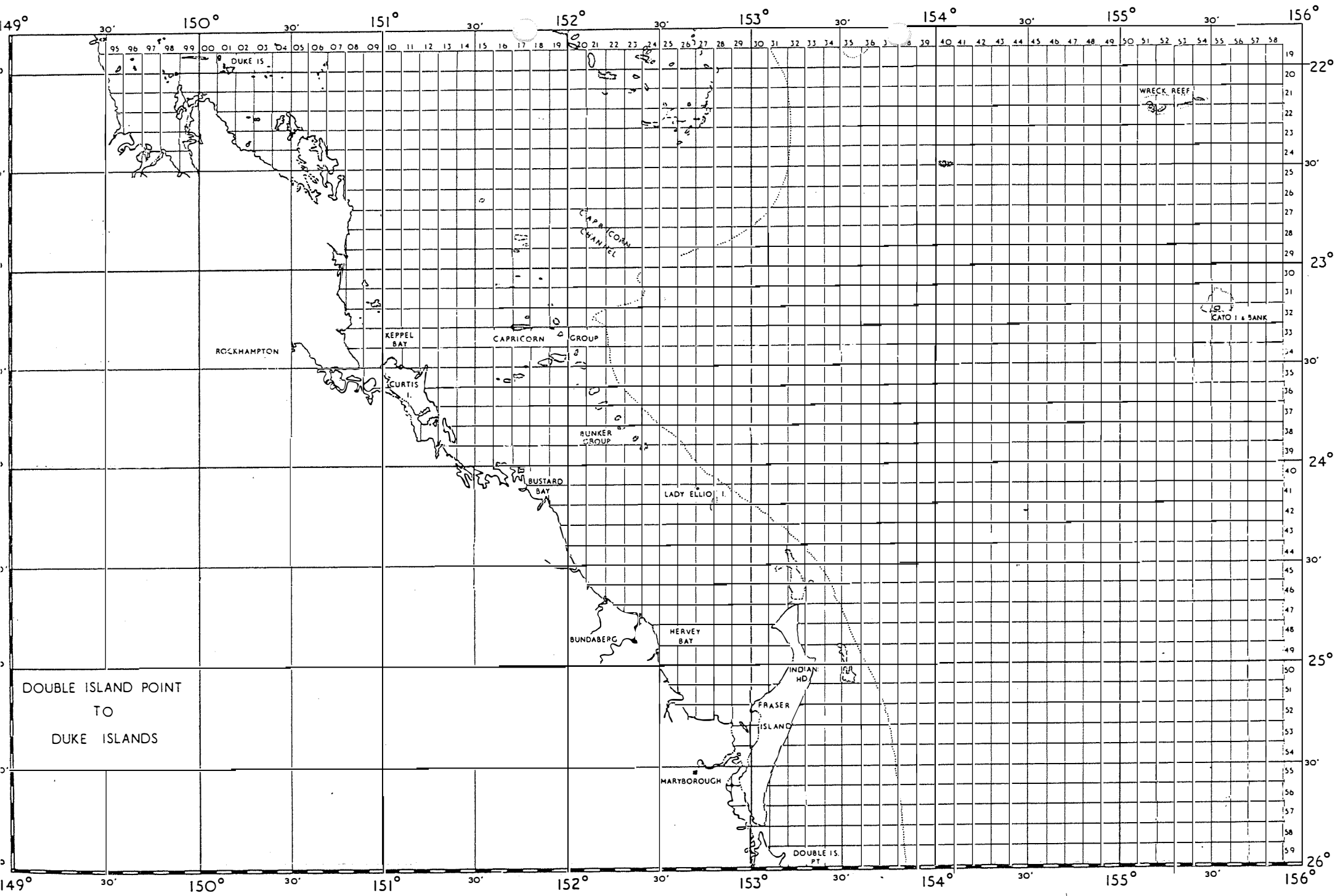
When more than 12 shots are completed within 24 hours, continue on next page.

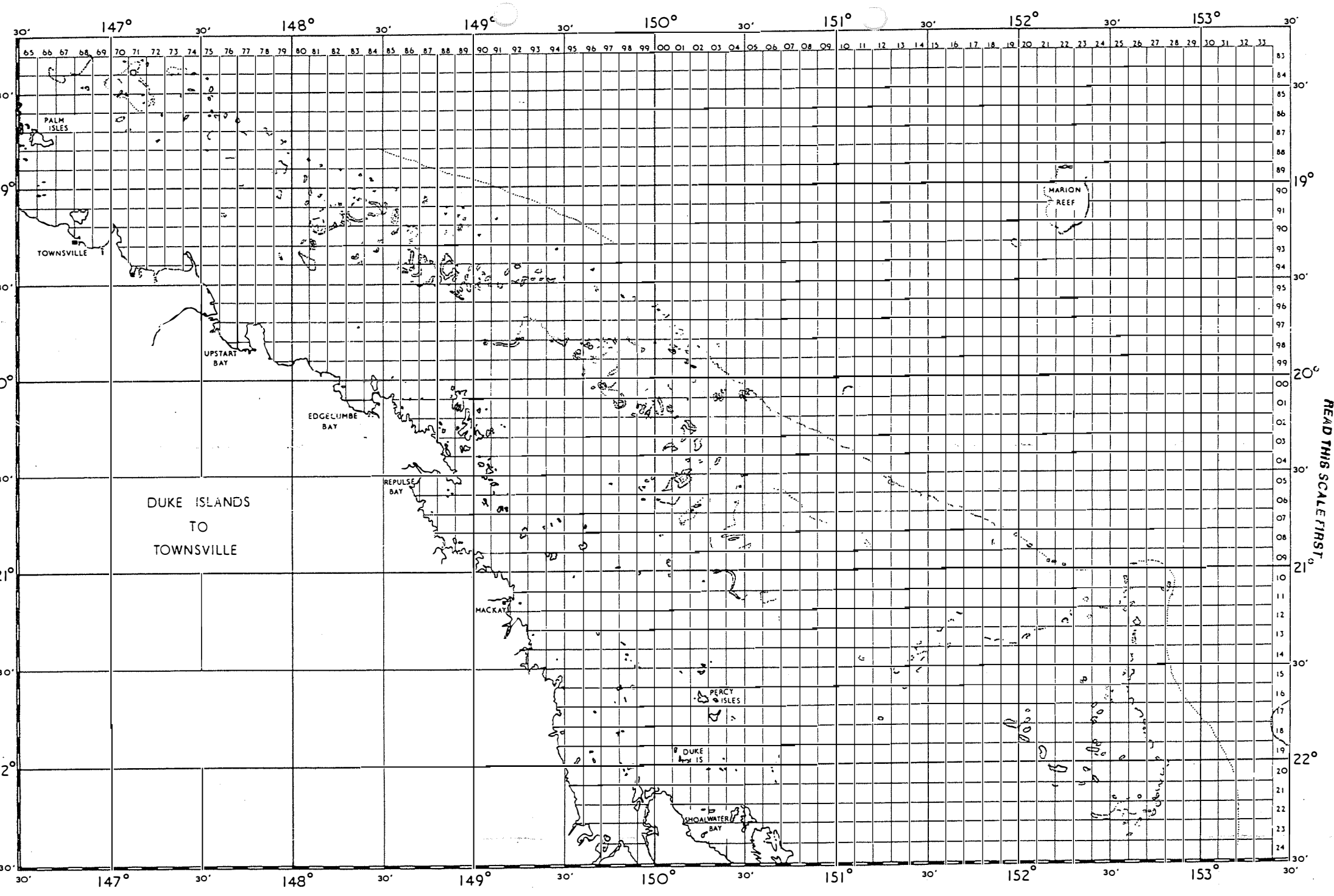


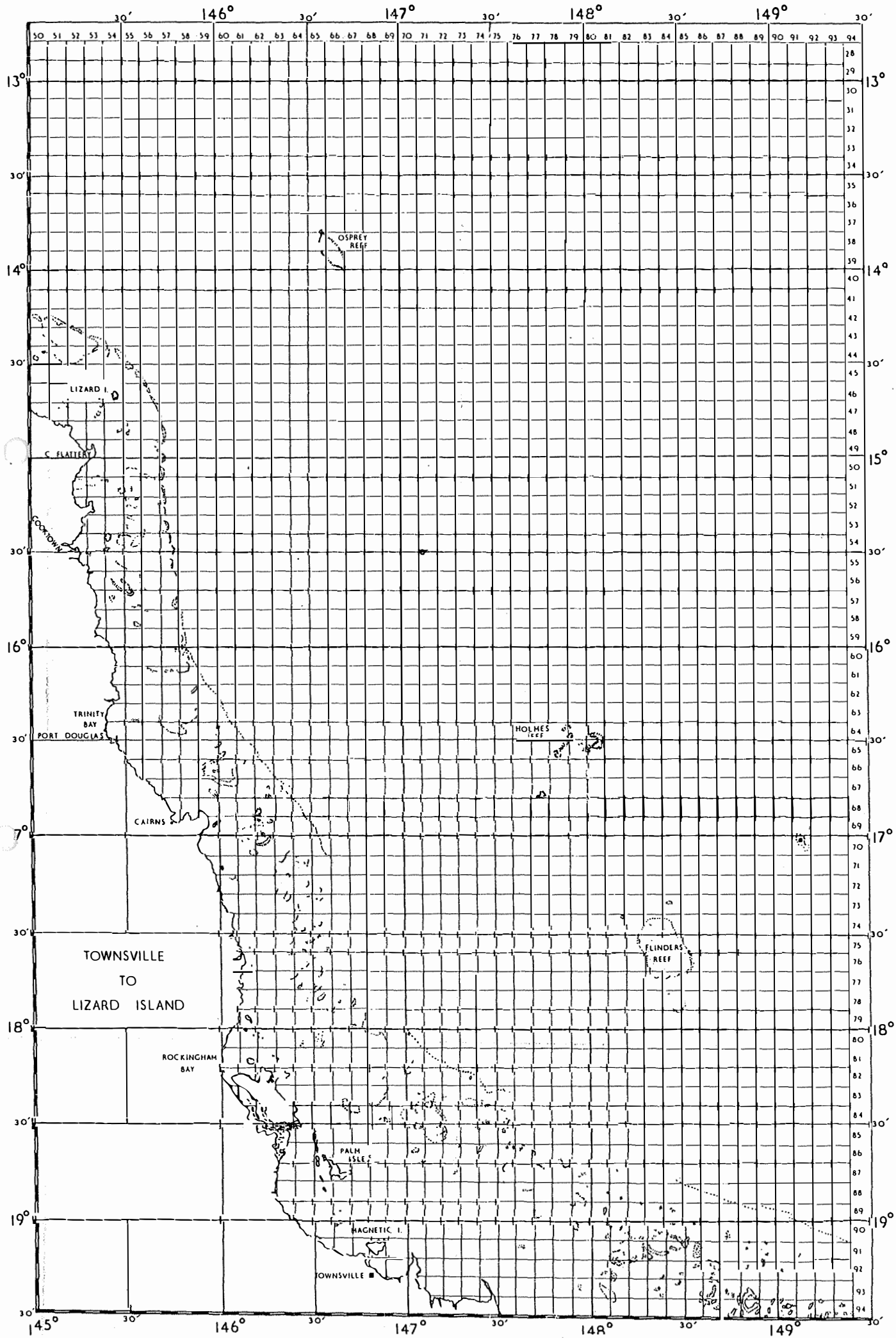
SHOT BY SHOT
CRAWL LOG



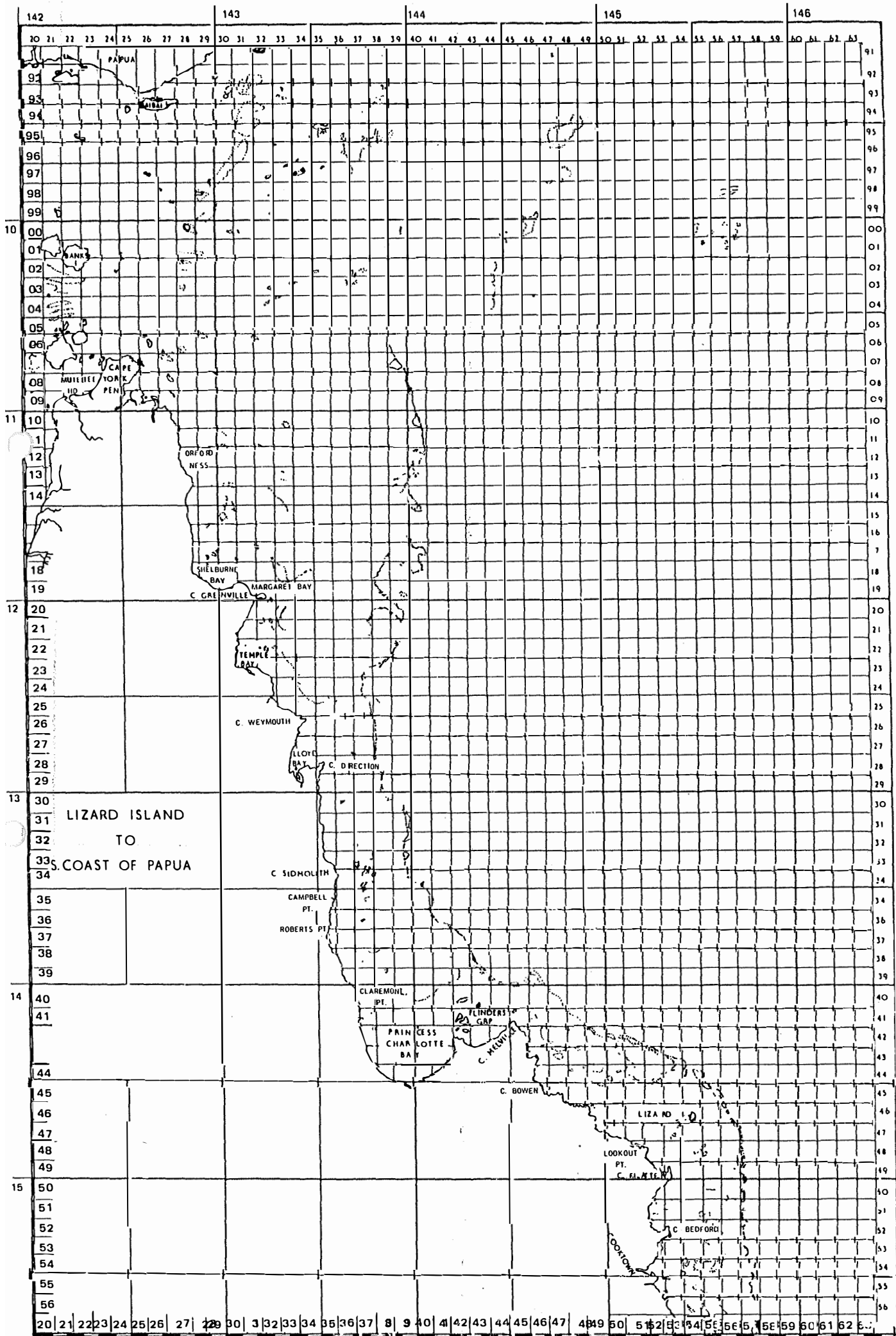
READ THIS SCALE FIRST



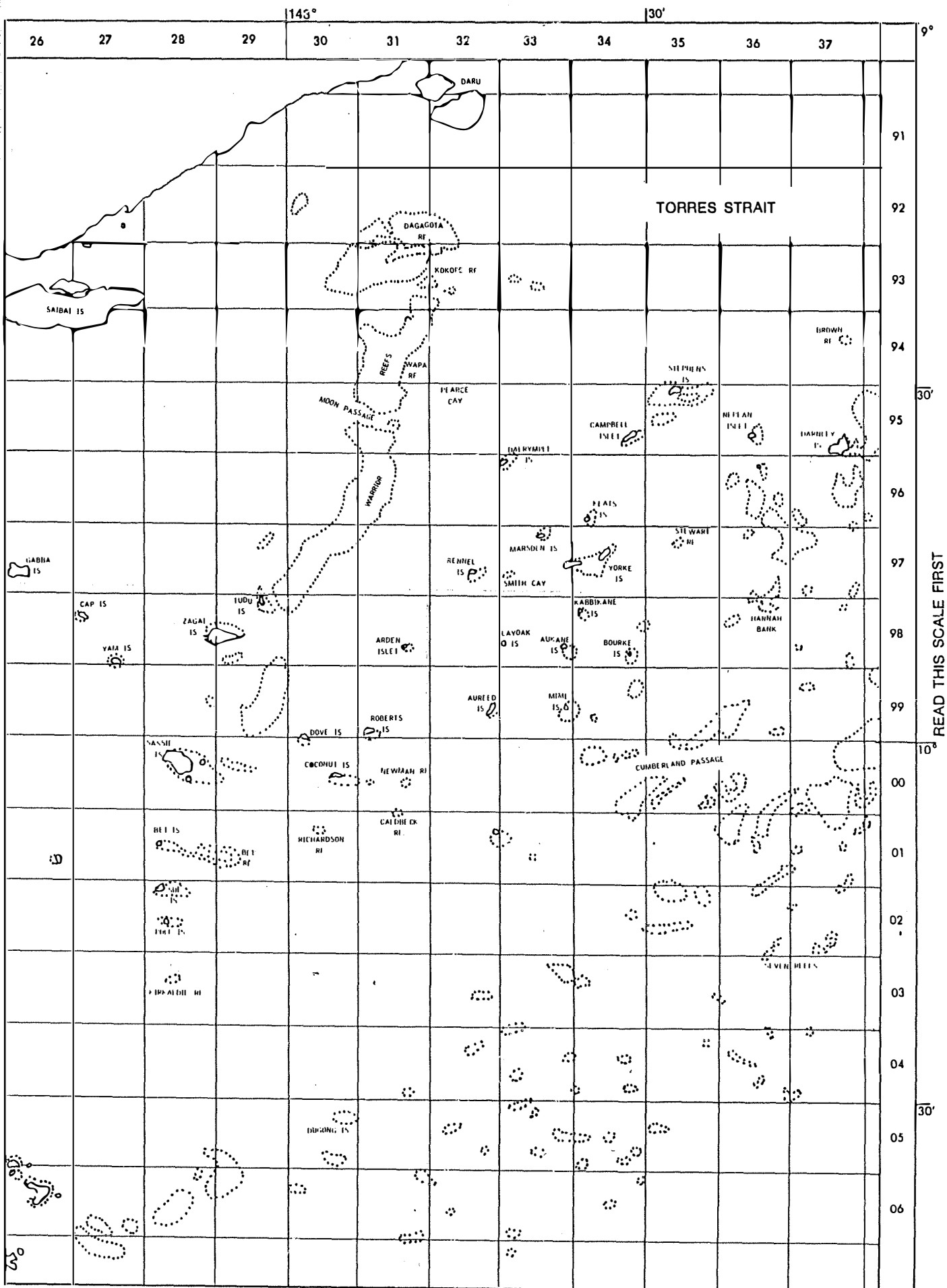




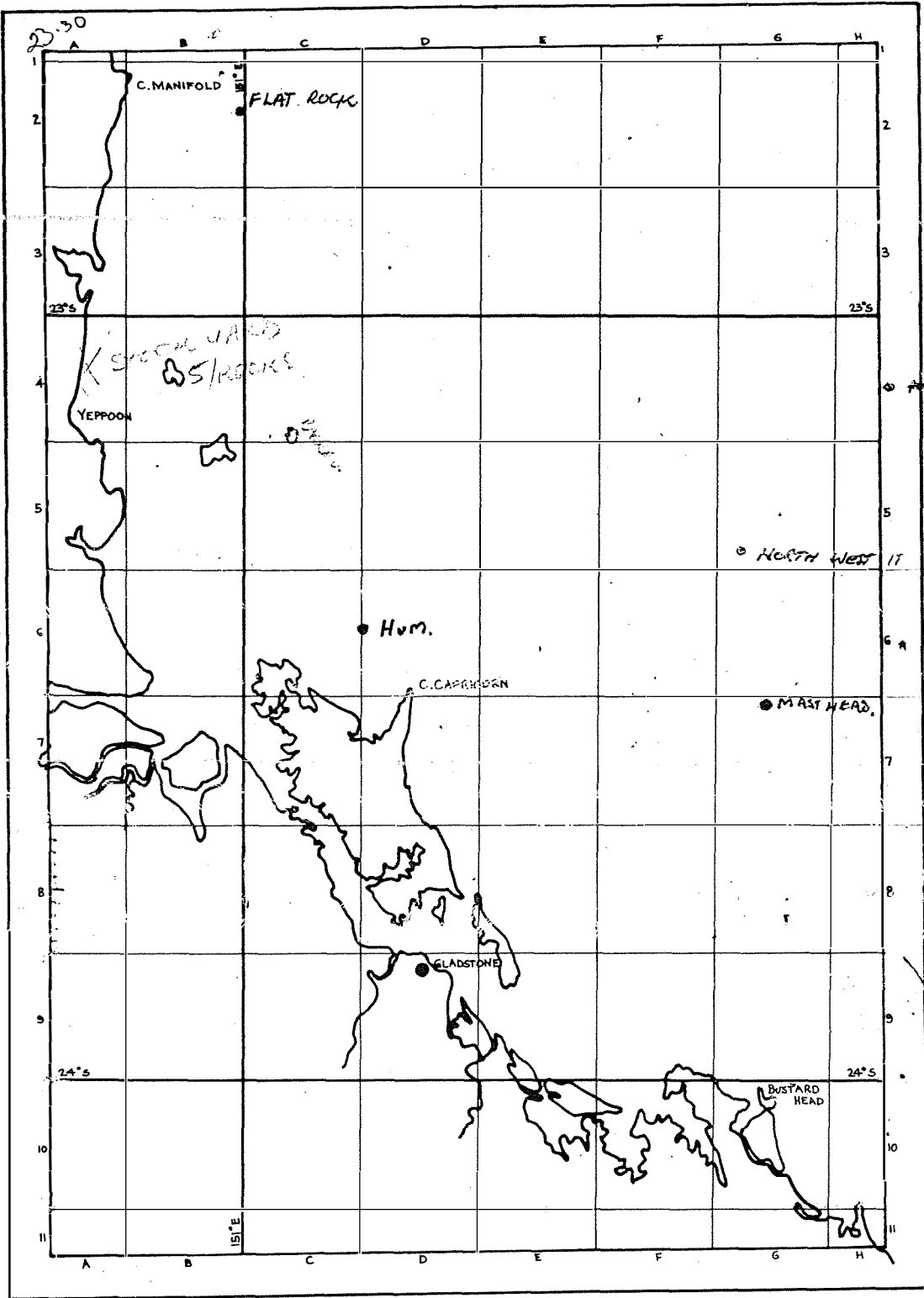
READ THIS SCALE FIRST



READ THIS SCALE FIRST



READ THIS SCALE FIRST





“OLD SOUTH-EAST COAST”

INSTRUCTIONS

PLEASE READ CAREFULLY

This book contains duplicate sets of numbered forms. The duplicate (green) copy is perforated to facilitate easy removal from the book. The original copy (white) remains in your book for your own reference.

To avoid the inconvenience of using loose sheets of carbon paper, the white page has been impregnated with carbon. Please place the piece of cardboard between the green (duplicate) page of the set in use and the white (original) page of the following set. If this is not done, the pressure of your pencil will transmit an image in carbon beyond the duplicate copy in the set and make records on the following pages illegible.

Fishing Area:

The maps provided show the grid system that is used in ocean waters to locate your fishing area. Used in conjunction with the depth fished it is possible to establish the total catch and effort of the fleet on any particular fishing ground.

When fishing in MORETON BAY your fishing area is best given by using the fisherman's description for the area which you are fishing. Some examples are — Red Buoy, Woody Point, King St., Reef, Greasy Hole, South-east of Mud, Green Leads, South of the Scarborough Blinker. By using this description in your log books it will be possible to obtain more information about prawn movements inside Moreton Bay.

Caloundra to Dunwich

Soundings in Feet referred to low Water Tides

Scale of Miles
Scale of Feet

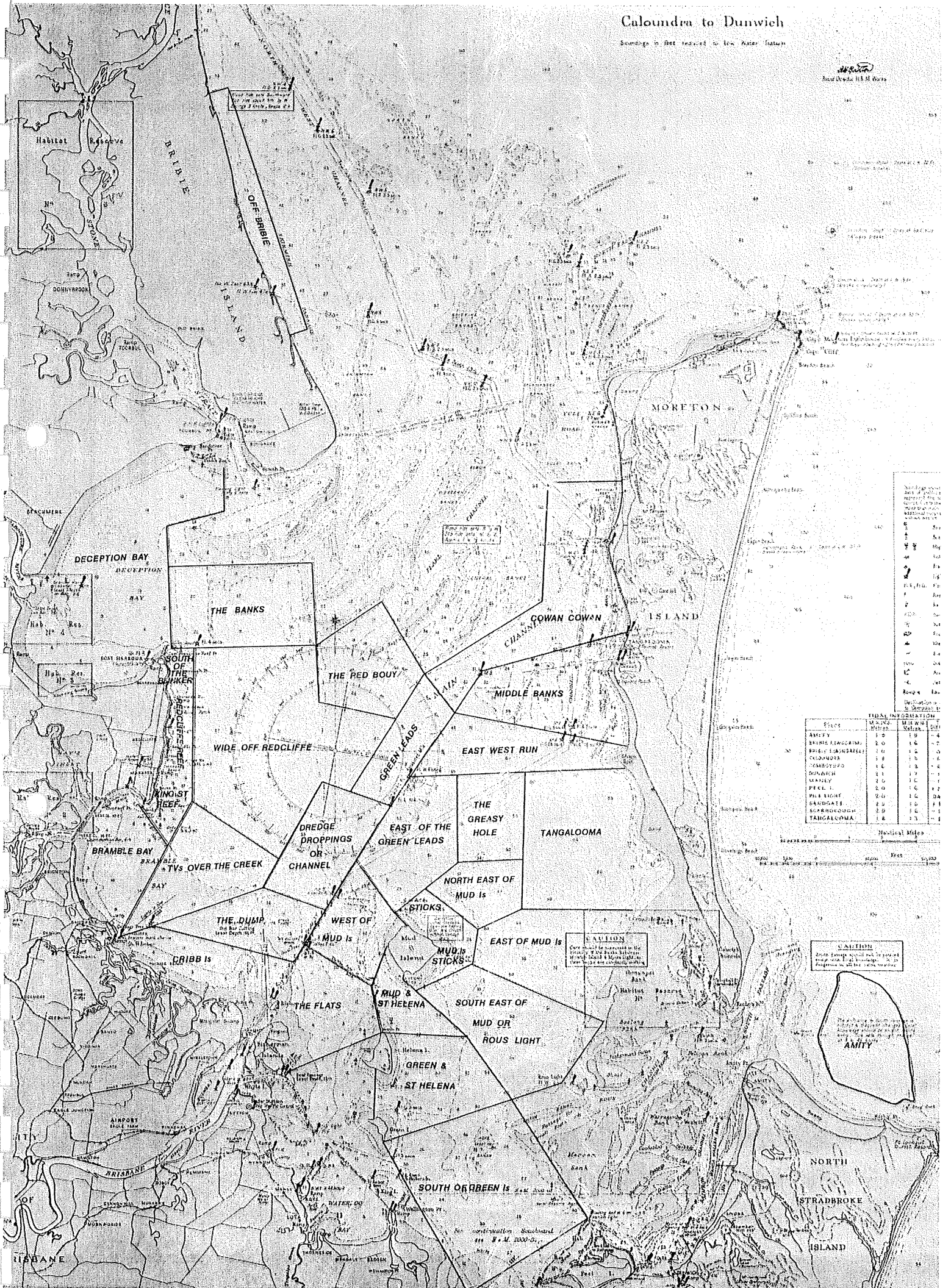


TABLE OF SOUNDINGS

| Soundings | Meaning |
|-----------|-----------|
| 1 | 1 fath. |
| 2 | 2 fath. |
| 3 | 3 fath. |
| 4 | 4 fath. |
| 5 | 5 fath. |
| 6 | 6 fath. |
| 7 | 7 fath. |
| 8 | 8 fath. |
| 9 | 9 fath. |
| 10 | 10 fath. |
| 11 | 11 fath. |
| 12 | 12 fath. |
| 13 | 13 fath. |
| 14 | 14 fath. |
| 15 | 15 fath. |
| 16 | 16 fath. |
| 17 | 17 fath. |
| 18 | 18 fath. |
| 19 | 19 fath. |
| 20 | 20 fath. |
| 21 | 21 fath. |
| 22 | 22 fath. |
| 23 | 23 fath. |
| 24 | 24 fath. |
| 25 | 25 fath. |
| 26 | 26 fath. |
| 27 | 27 fath. |
| 28 | 28 fath. |
| 29 | 29 fath. |
| 30 | 30 fath. |
| 31 | 31 fath. |
| 32 | 32 fath. |
| 33 | 33 fath. |
| 34 | 34 fath. |
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| 36 | 36 fath. |
| 37 | 37 fath. |
| 38 | 38 fath. |
| 39 | 39 fath. |
| 40 | 40 fath. |
| 41 | 41 fath. |
| 42 | 42 fath. |
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| 89 | 89 fath. |
| 90 | 90 fath. |
| 91 | 91 fath. |
| 92 | 92 fath. |
| 93 | 93 fath. |
| 94 | 94 fath. |
| 95 | 95 fath. |
| 96 | 96 fath. |
| 97 | 97 fath. |
| 98 | 98 fath. |
| 99 | 99 fath. |
| 100 | 100 fath. |

TABLE OF SOUNDINGS

| Soundings | Meaning |
|-----------|-----------|
| 1 | 1 fath. |
| 2 | 2 fath. |
| 3 | 3 fath. |
| 4 | 4 fath. |
| 5 | 5 fath. |
| 6 | 6 fath. |
| 7 | 7 fath. |
| 8 | 8 fath. |
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| 14 | 14 fath. |
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| 93 | 93 fath. |
| 94 | 94 fath. |
| 95 | 95 fath. |
| 96 | 96 fath. |
| 97 | 97 fath. |
| 98 | 98 fath. |
| 99 | 99 fath. |
| 100 | 100 fath. |

Scale of Miles
Scale of Feet

Scale of Miles
Scale of Feet

Scale of Miles
Scale of Feet

Scale of Miles
Scale of Feet

Scale of Miles
Scale of Feet

Scale of Miles
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Scale of Miles
Scale of Feet

Scale of Miles
Scale of Feet

ORIGINAL

QLD. SOUTH-EAST COAST
PRAWN FISHERMAN'S DAILY LOG

No 55801

DATE VESSEL PORT AREA SKIPPER

No. of SHOTS

TOTAL LANDED WT. 1. KINGS lb. 2. TIGERS lb.

3. BAYS lb. 4. OTHERS lb.

| SHOT No. | TIME * STARTED | DURATION | FISHING AREA | DEPTH | CATCH WEIGHTS | | | | NOTES ON TRASH, NET DAMAGE, TAGS, ETC. |
|----------|----------------|----------|--------------|-------|---------------|-------|-----|------------------|--|
| | | | | | KING | TIGER | BAY | OTHERS (SPECIFY) | |
| 1 | | | | | | | | | |
| 2 | | | | | | | | | |
| 3 | | | | | | | | | |
| 4 | | | | | | | | | |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
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| 9 | | | | | | | | | |
| 10 | | | | | | | | | |
| 11 | | | | | | | | | |
| 12 | | | | | | | | | |

* Use 24 hour clock system. Start a new page at 7 a.m.

REMARKS:



D.P.I. OTTER TRAWL STUDY

FISHERIES MANAGEMENT BRANCH,
QUEENSLAND DEPARTMENT OF PRIMARY INDUSTRIES
G.P.O. BOX 46,
BRISBANE, Q. 4001

OTTER TRAWL STUDY

1. The information provided is treated as confidential and will be used only for research purposes. Information supplied by an individual will only be made available to the individual concerned.
2. The white copy of the logbook should be posted along with other cost details on the Freepost envelopes provided. Postage stamps are not required on these envelopes. The pink copy of the logbook should be retained for your own records.

Notes for completing log sheets

1. Fill in logs daily when fishing. If the day is spent undertaking repairs or if the weather should prevent you from going out fishing this information should be recorded when convenient in the comments section.
2. Indicate the start of a trip by placing an S in the far left column and the end of a trip by placing an F in the far left hand column.
3. Engine hours should be recorded at the start of each fishing trip. If engine hours are not shown on a tachometer, the number of hours the engine worked should be estimated.
4. Area(s) fished should be taken from maps in the front section of the logbook. Please indicate in the comments section if you fished out of a port other than your usual home port and the area fished.
5. Symbols should be used for the count of prawns i.e. (L) for less than 30/kg, (M) for 30 to 60/kg, (S) for 60+/kg, and scallops 1st (1), 2nd (2) and 3rd (3).
6. Please feel free to use the Comments section if there is not sufficient room to record catch in the "species landed" column.
7. If you have any queries please contact Angela Moxon or Barry Steele (07) 227 5428.

WORKED EXAMPLE

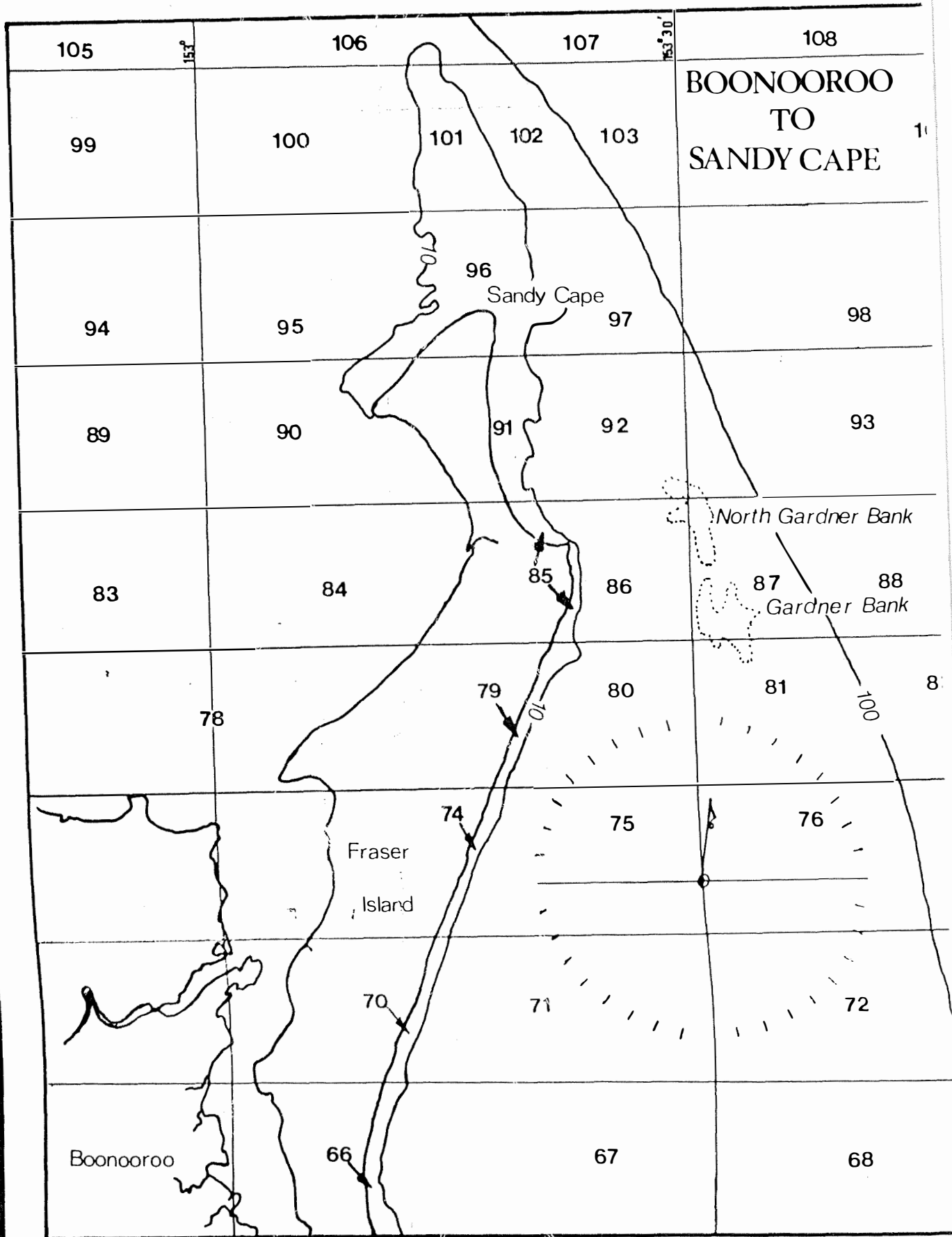
D.P.I. OTTER TRAWL STUDY

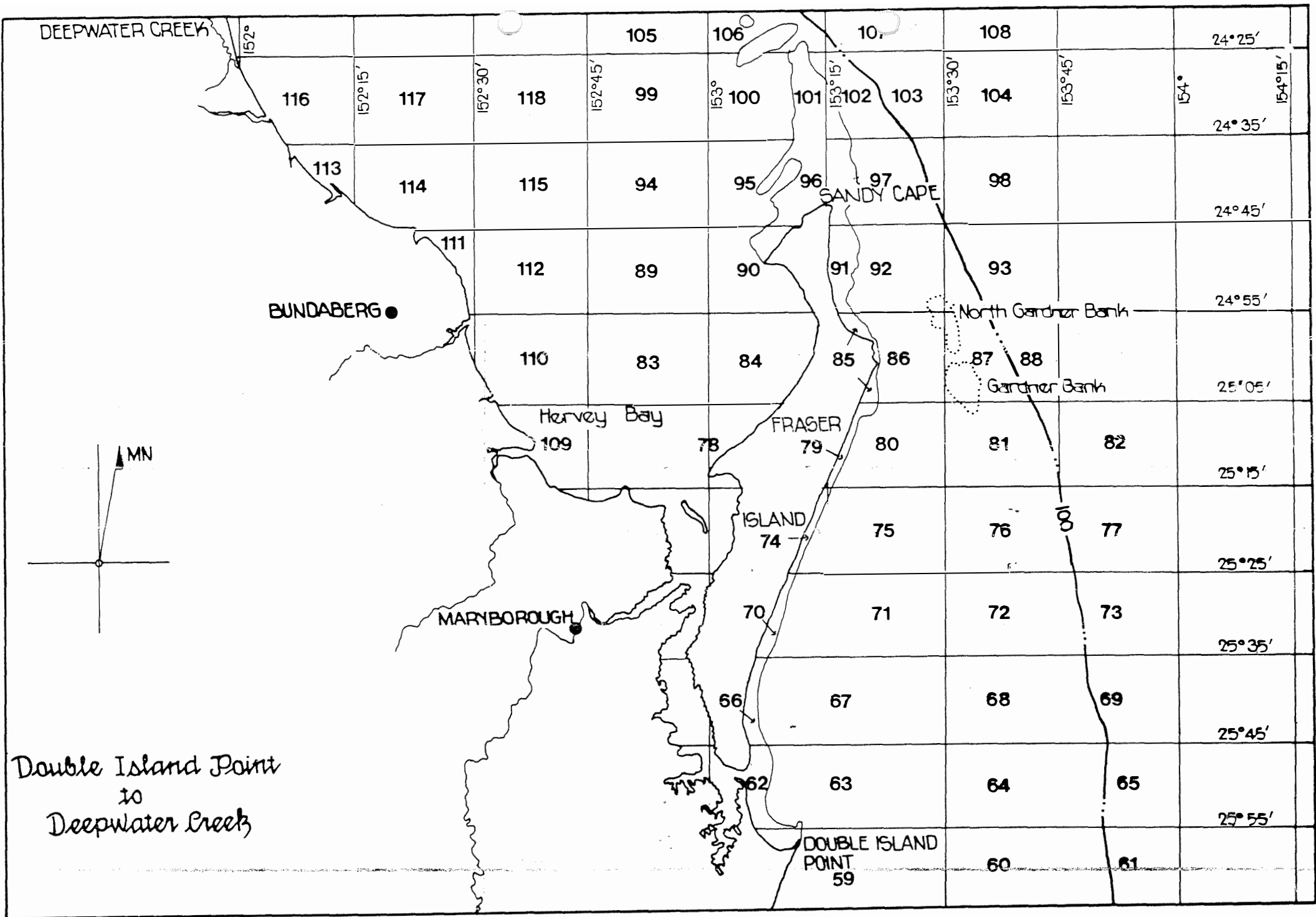
PAGE NO. P 7780

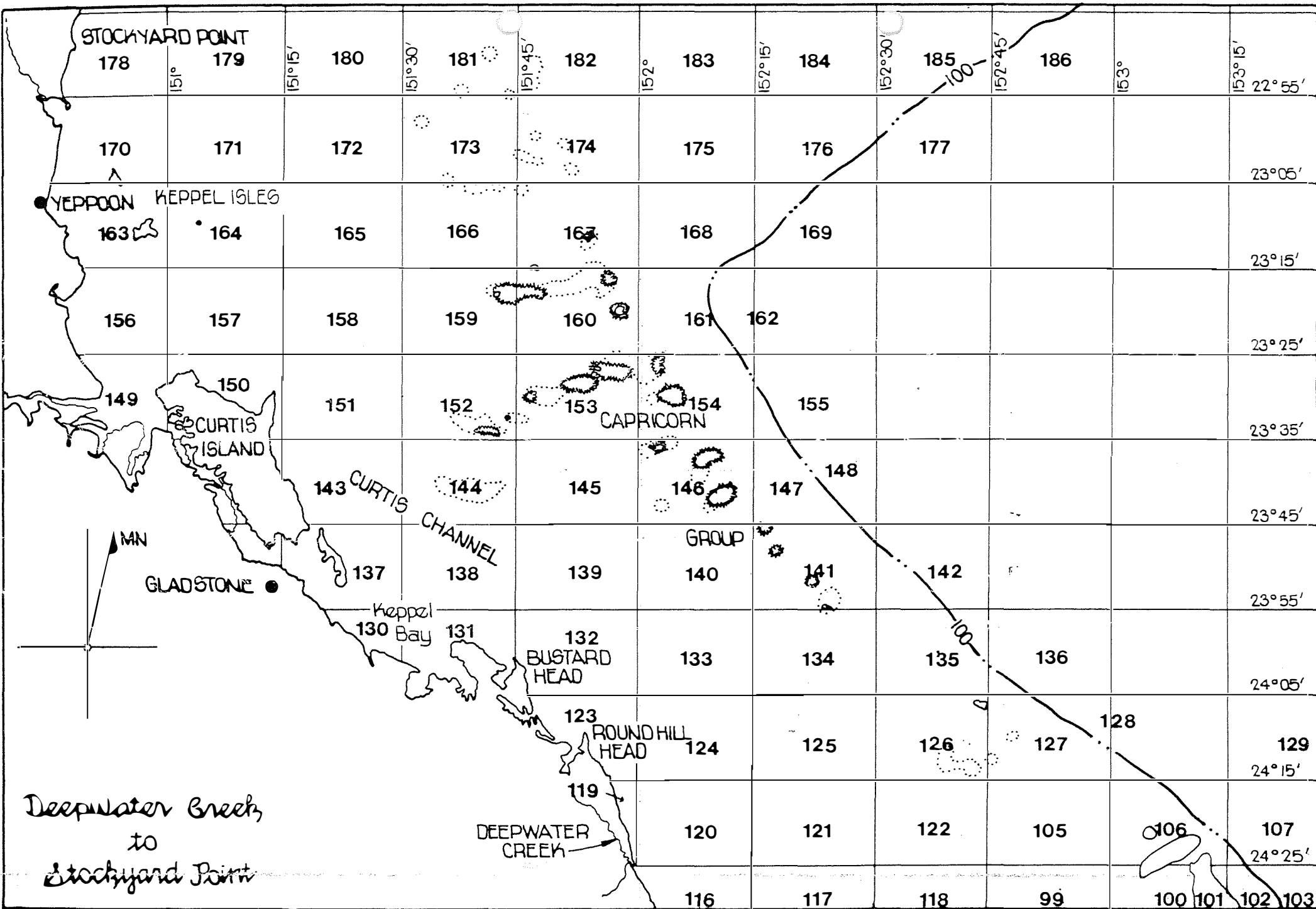
BOAT NAME SEA HUNTER

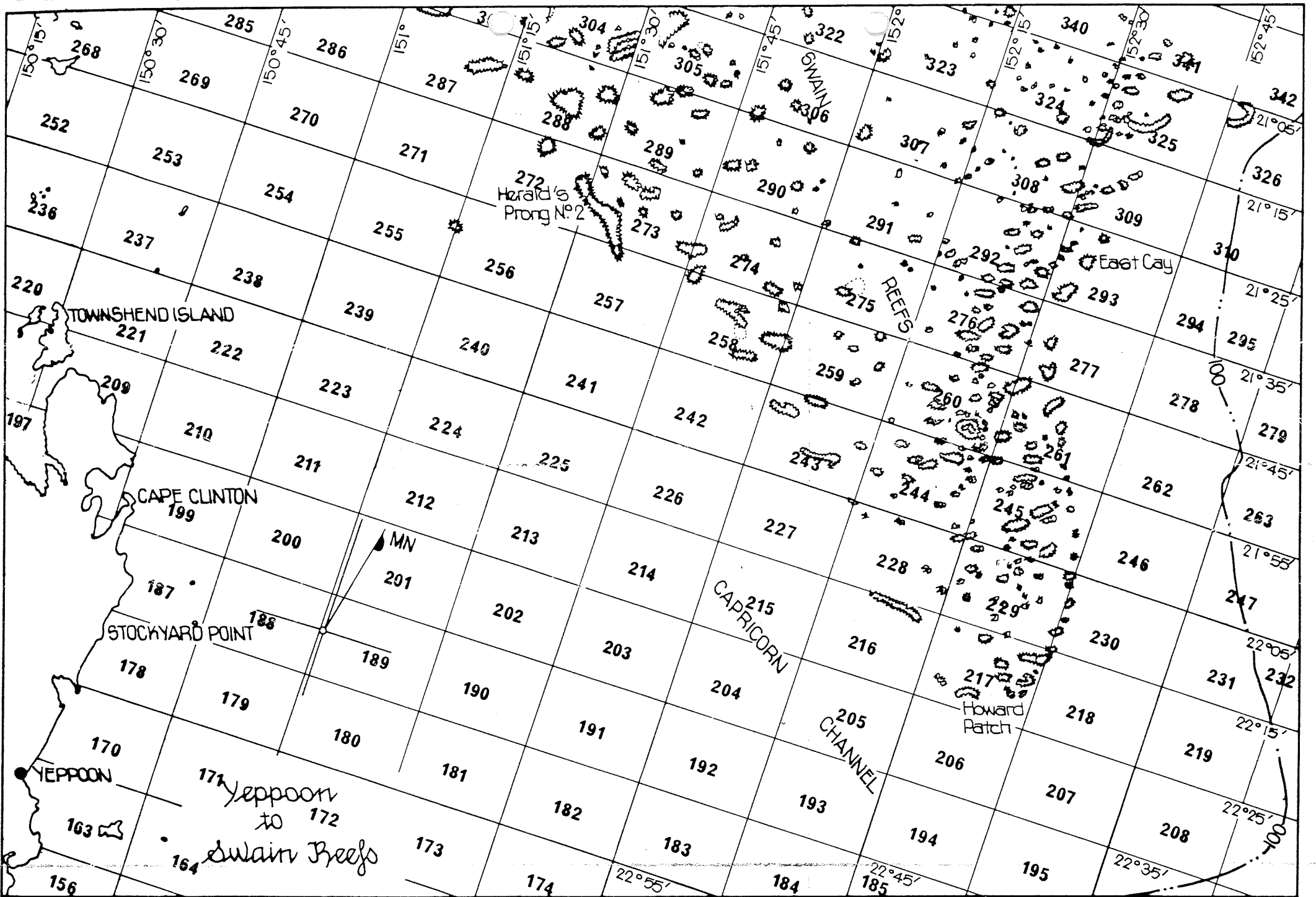
| S START F FINISH | DATE | ENGINE HOURS | NO. OF SHOTS | AV. LENGTH OF SHOT | AREAS FISHED | SPECIES LANDED (kg) | | | | | COMMENTS <small>(BREAKDOWNS, BLOWN NETS, GEAR FAILURE, REPAIRS, ETC.)</small> | |
|---------------------------|-----------|-----------------|--------------------|-----------------------|-----------------|----------------------|------|--------------|--------|---------|--|--------------|
| | | | | | | SCALLOPS (Basket) | KING | TIGER | BANANA | OTHER | | |
| | SUNDAY | | | | | | | | | | | |
| | 1 1 | | | | | | | | | | | |
| S | MONDAY | 15962 | 6 | 1 1/2 | 311 | | | | | 5 BUGS | 15-20 SE | |
| | 8 9 186 | | | | 3/2 | 90L | 15L | 20 SANDGRABS | | | | |
| | TUESDAY | | 9 | 2 | 327 | | | | | 10 BUGS | SHARKS CHAWED BIG HOLE LEFT COD-END. CAME HOME | |
| F | 9 19 186 | | | | 344 | 60L | 30M | 35 SANDGRABS | | | | |
| | WEDNESDAY | | | | | | | | | | | |
| | 1 1 | | | | | | | | | | | RAIN & ROUGH |
| S | THURSDAY | 16002 | 3 | 1/2 | 351/360 | | | | | 300L | BLEW HYDRAULIC HOSE IN GEAR BOX - STEAMED HOME ON "COME-HOME" SCREWS. | |
| F | 11 19 186 | | | | 361 | | | | | | | |
| | FRIDAY | | | | | | | | | | | |
| | 1 1 | | | | | | | | | | | |
| S | SATURDAY | 16031 | 2 | 1 | 343, 351, | | | | | | 20 SAND CRABS | NO PRAWNS |
| | 1 1 | | | | 360, 361 | | | | | | | |

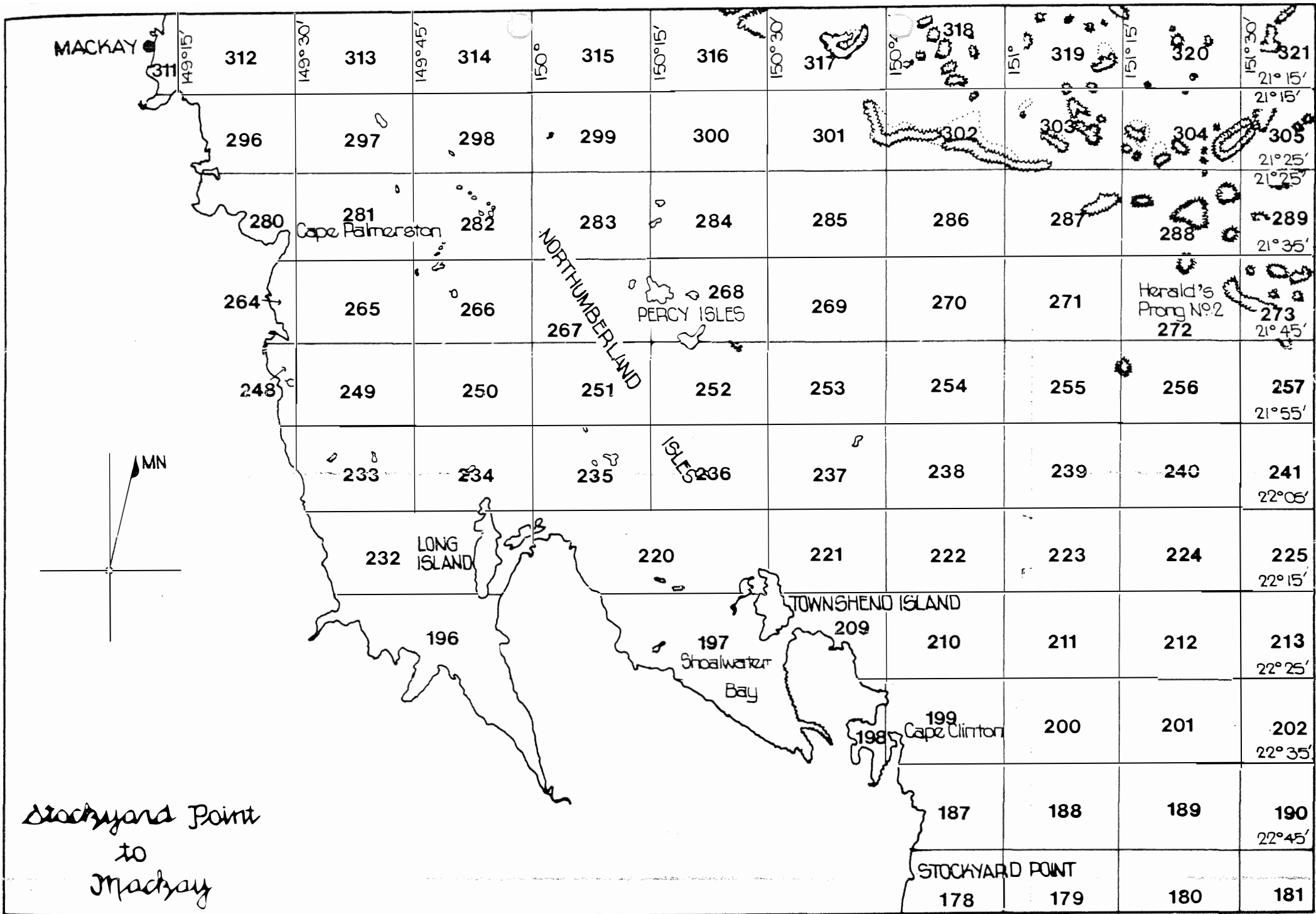
Please indicate prawn count: less than 30/kg (L), 30 to 60/kg (M), 60+/kg (S).
scallop count: 1st (1), 2nd (2) and 3rd (3).

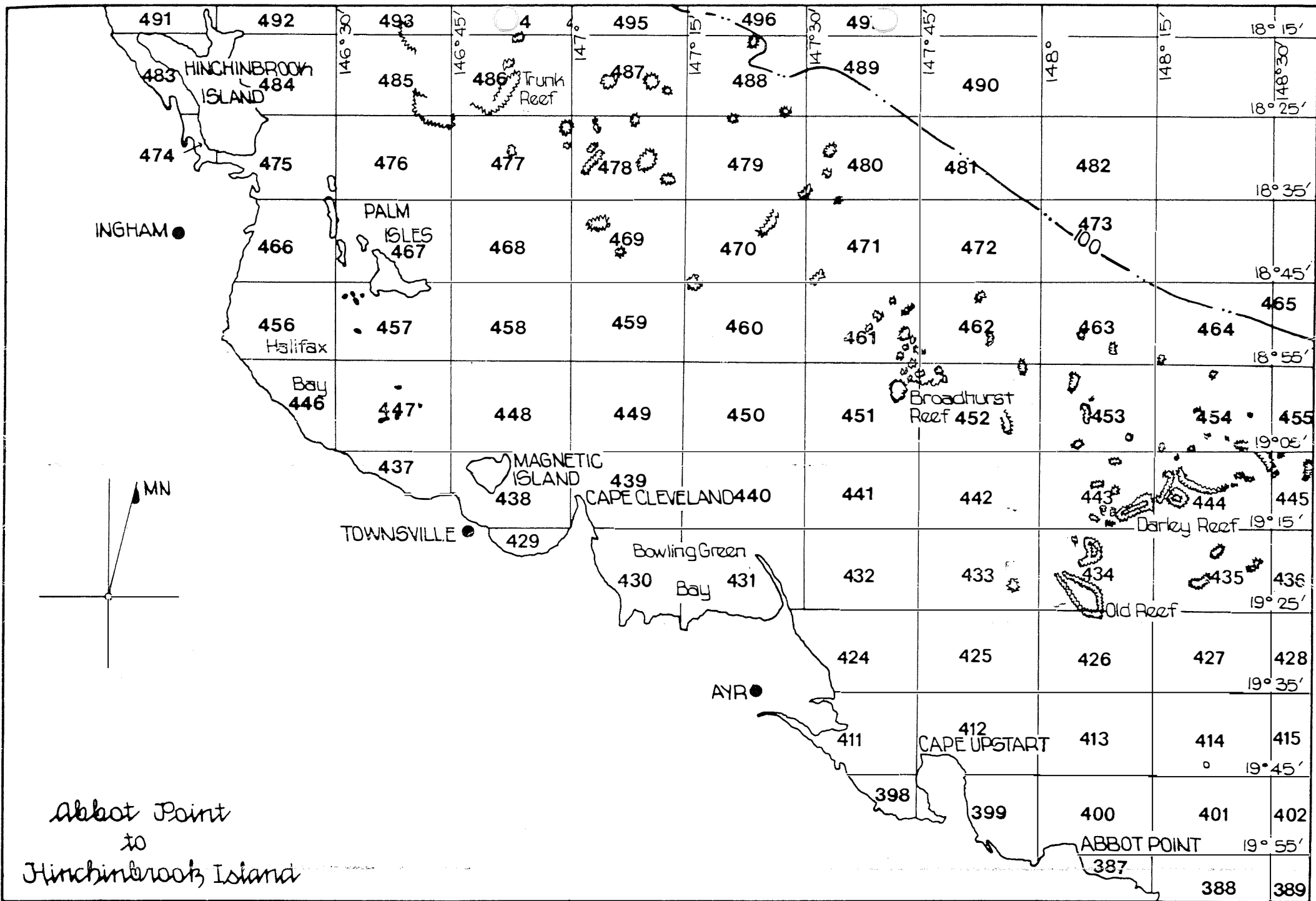


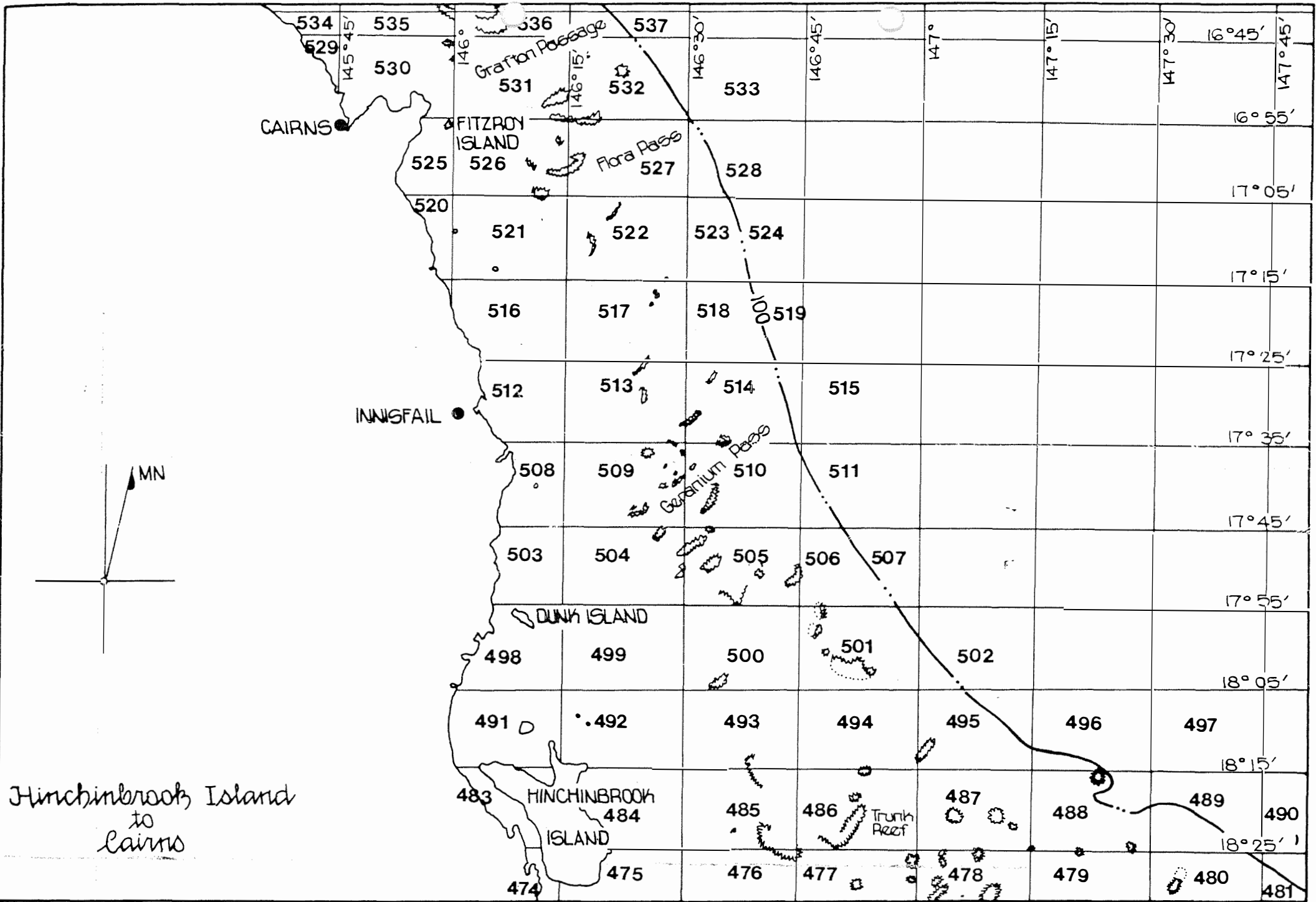












Hinchinbrook Island
to
Cairns

D.P.I. OTTER TRAWL STUDY

BOAT NAME.....

| START F BUSH | DATE | ENGINE HOURS | NO. OF SHOTS | AV. LENGTH OF SHOT | AREA/S FISHED | SPECIES LANDED (kg) | | | | | COMMENTS (BREAKDOWNS, BLOWN NETS, GEAR FAILURE, REPAIRS, ETC.) |
|--------------------|-----------|-----------------|--------------------|-----------------------|------------------|----------------------|------|-------|--------|-------|--|
| | | | | | | SCALLOPS (Basket) | KING | TIGER | BANANA | OTHER | |
| | SUNDAY | | | | | | | | | | |
| | / / | | | | | | | | | | |
| | MONDAY | | | | | | | | | | |
| | / / | | | | | | | | | | |
| | TUESDAY | | | | | | | | | | |
| | / / | | | | | | | | | | |
| | WEDNESDAY | | | | | | | | | | |
| | / / | | | | | | | | | | |
| | THURSDAY | | | | | | | | | | |
| | / / | | | | | | | | | | |
| | FRIDAY | | | | | | | | | | |
| | / / | | | | | | | | | | |
| | SATURDAY | | | | | | | | | | |
| | / / | | | | | | | | | | |

Please indicate prawn count: less than 30/kg (L), 30 to 60/kg (M), 60+ /kg (S).
 scallop count: 1st (1), 2nd (2) and 3rd (3).

**Attachment 3 Logbooks identified from previous
research/monitoring programs**

**SCALLOP
MANAGEMENT
LOGBOOK**

USING THE SCALLOP FISHERY MANAGEMENT LOGBOOK

The scallop fishery management Logbook has been introduced by the Queensland Fish Management Authority to obtain information on catch/effort in this fishery. This follows concern about the future of this fishery and more data is needed to allow for management of this fishery.

The Logbook is a multi-purpose one designed to record daily production from the scallop and/or prawn fishery.

Consequently it is to your benefit to provide accurate and timely information. All vessels fishing for scallops of the Central Queensland species [*Amusium japonicum ballotti*] must provide these Logbooks Sheets about your scallop catch as a requirement to continue to hold a commercial fishing vessel licence. Although not mandatory at this stage, it would be appreciated if you would provide information on your total trawl catch.

Your information will be **confidential** to fisheries officers who will collate the data. Information will be made available to the industry in summary form only. It will not be possible to identify production from any individual fisherman or from particular fishing grounds.

You are required to send in the logbook sheets for one month before the 15th of the following month. For example, March returns must be sent in before the 15th of April. If one trip straddles two months please include the sheets for the month when the trip started.

The completed Logbook sheets are to be sent to:

Secretary
Qld Fish Management Authority
PO Box 344
FORTITUDE VALLEY QLD 4006.

Should you have any questions about using the Logbook please phone Lew Williams, Fisheries Management Branch, Department of Primary Industries (07) 224 6908 or the QFMA (07) 227 6242.

In the front of the Logbook is a form that will provide background information about your scallop fishing operations which will be useful in helping us to make proper management decisions. Please complete and send in with your first return.

Duplicate sheets are provided in the logbook. The top (green) sheet is to be sent to the QFMA. The duplicate copy is for your records.

The management Log has been made easy for you to use by:

- Large grids which are shown on the five charts in the front of the book. Each grid has a number, for example the grid east of Keppel Bay is numbered 233. It basically covers the area from 23 to 23 degrees 30 minutes latitude and 151 to 152 degrees longitude. Should you wish to record that you fished in two grids please indicate the percentage of time spent trawling in each grid.
- Hours trawled column is to record the time spent trawling. It is not to record the time spent steaming. If for example, you had gear damage and it took 5 hours to repair and you were on the grounds for 20 hours trawling time would be 15 hours.
- At the end of each trip you are asked to record the average count of the scallops you land.
- Should a trip last more than the eight days shown on the sheet please continue that trip information on the next sheet.
- Start each new trip on a new page. However if you are doing day trips record all the information on one sheet.
- The day is assumed to start at 0700 hours. Please record the time in the following format. For example 3.30 pm is written as 15.30.
- When you change your nets please note the changes in the comments column.
- A calendar is provided inside the flap.

SCALLOP FISHERY- BACKGROUND INFORMATION

NAME OF OWNER TELEPHONE NUMBER

VESSEL NAME VESSEL SYMBOLS PORT USUALLY OPERATE FROM

GEAR CONFIGURATION USUALLY USED FOR SCALLOPS

RIG USED SINGLE _____ TWIN _____ TRIPLE _____ QUAD _____

MESH SIZE _____ mm (Measured inside the knots) HOW LONG DO YOU EXPECT A NET TO LAST?

TOTAL HEAD AND BOTTOM ROPE LENGTH SIZE OF EACH NET (eg 6 fathom net)

TYPE OF BOARDS USED BOARD SIZE X

HOW MANY EXTRA SCALLOP NETS DO YOU USUALLY CARRY ON BOARD?

WHAT OTHER TRAWL GEAR DO YOU USUALLY CARRY WHEN SCALLOPING? (eg King prawn gear)

WHAT IS YOUR USUAL TRAWLING SPEED WHEN SCALLOPING? KNOTS

WHAT IS THE USUAL LENGTH OF TRIP WHEN YOU ARE SCALLOPING? DAYS

WHAT SORTING METHOD ARE USED FOR SCALLOPS— HAND DRUM OTHER

WHAT TYPE OF REFRIGERATION IS USED ON BOARD? ICE RSW DRY OTHER (SPECIFY)

HOW MANY BASKETS OF SCALLOP CAN YOU CARRY IN YOUR HOLD/S IN REFRIGERATION? _____

IN WHICH MONTHS DO YOU USUALLY TRAWL FOR SCALLOPS?

COMMENTS

SCALLOP FISHERY-BACKGROUND INFORMATION

NAME OF OWNER TELEPHONE NUMBER

VESSEL NAME VESSEL SYMBOLS PORT USUALLY OPERATE FROM

GEAR CONFIGURATION USUALLY USED FOR SCALLOPS

RIG USED SINGLE _____ TWIN _____ TRIPLE _____ QUAD _____

MESH SIZE _____ mm (Measured inside the knots) HOW LONG DO YOU EXPECT A NET TO LAST?

TOTAL HEAD AND BOTTOM ROPE LENGTH SIZE OF EACH NET (eg 6 fathom net)

TYPE OF BOARDS USED BOARD SIZE x

HOW MANY EXTRA SCALLOP NETS DO YOU USUALLY CARRY ON BOARD?

WHAT OTHER TRAWL GEAR DO YOU USUALLY CARRY WHEN SCALLOPING? (eg King prawn gear)

.....
.....

WHAT IS YOUR USUAL TRAWLING SPEED WHEN SCALLOPING? KNOTS

WHAT IS THE USUAL LENGTH OF TRIP WHEN YOU ARE SCALLOPING? DAYS

WHAT SORTING METHOD ARE USED FOR SCALLOPS— HAND DRUM OTHER

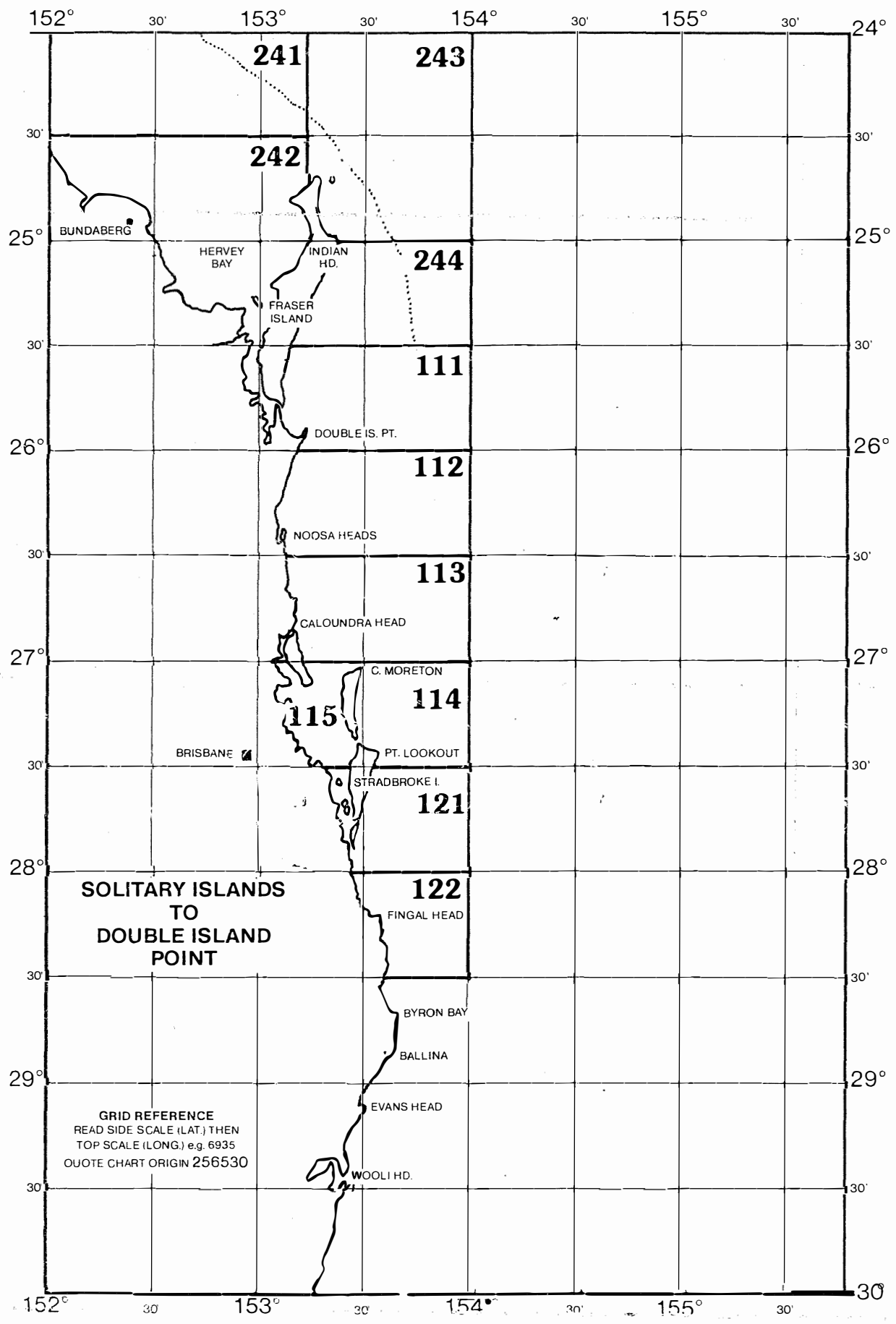
WHAT TYPE OF REFRIGERATION IS USED ON BOARD? ICE RSW DRY OTHER (SPECIFY)

HOW MANY BASKETS OF SCALLOP CAN YOU CARRY IN YOUR HOLD/S IN REFRIGERATION? _____

IN WHICH MONTHS DO YOU USUALLY TRAWL FOR SCALLOPS?

COMMENTS

.....



152° 30' 153° 30' 154° 30' 155° 30' 24°

30' 242 243 30'

25° BUNDABERG 242 244 25°

30' 244 111 30'

26° 112 26°

30' 113 30'

27° 114 27°

30' 115 121 30'

28° SOLITARY ISLANDS TO DOUBLE ISLAND POINT 122 28°

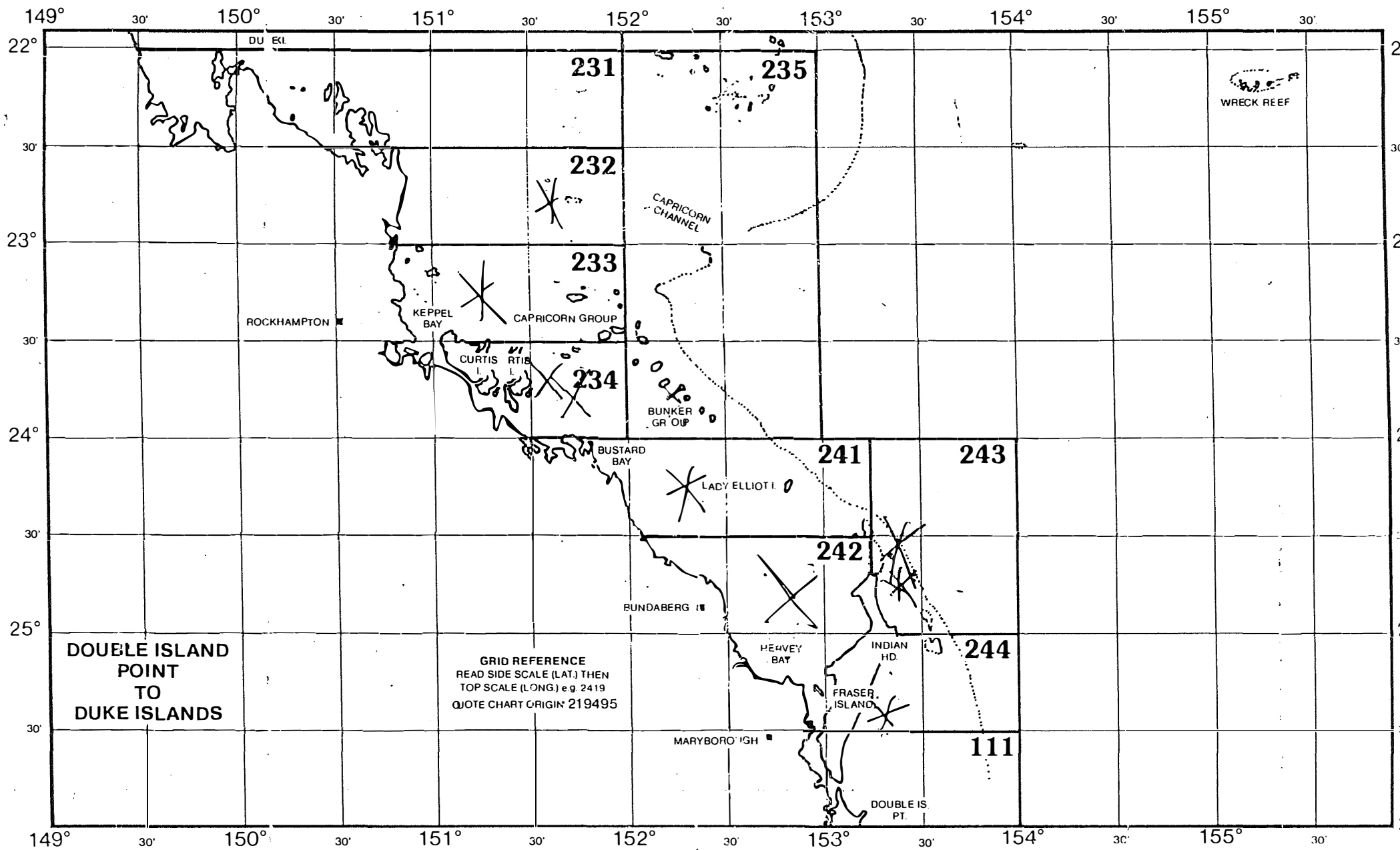
30' 30'

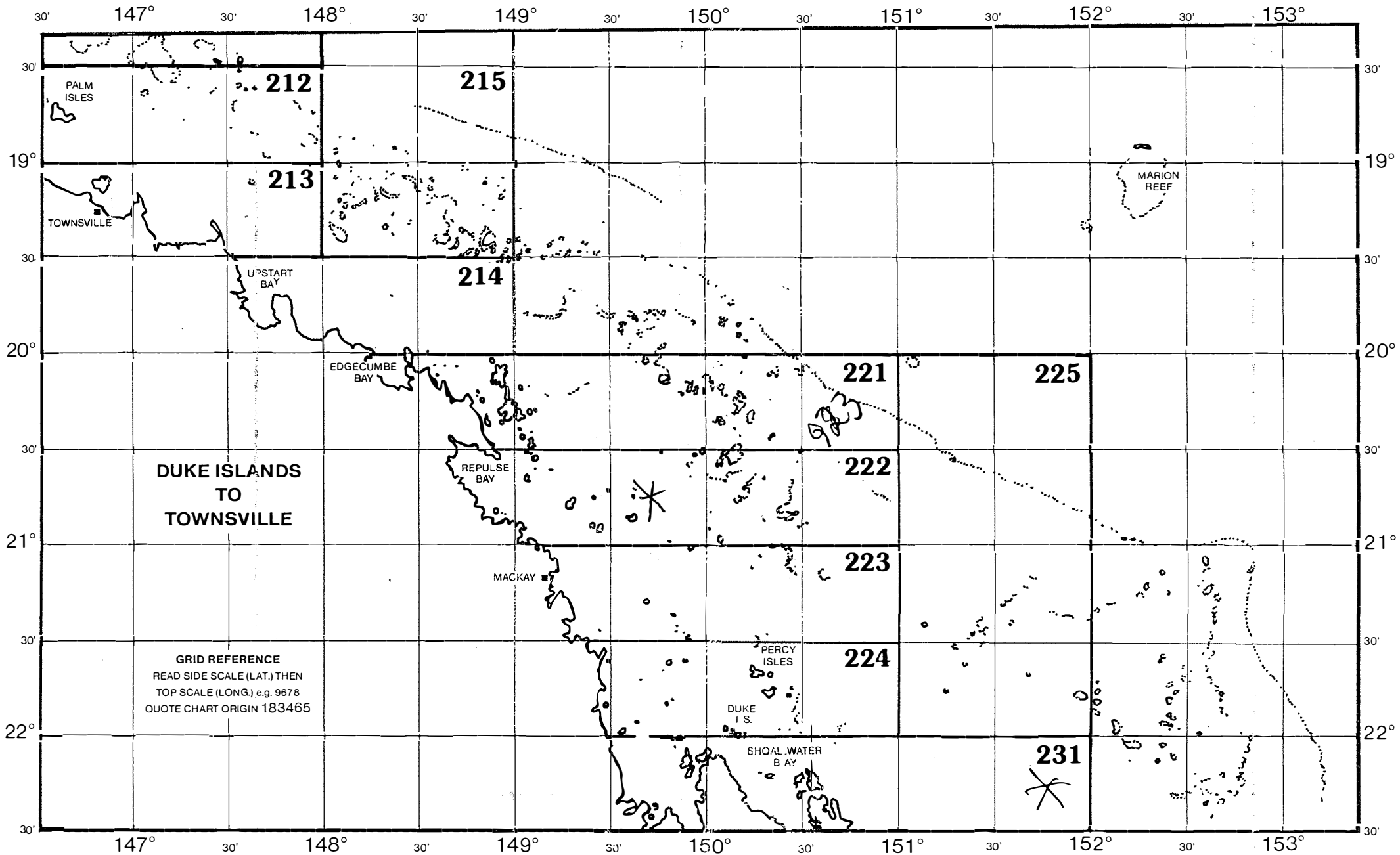
29° 29°

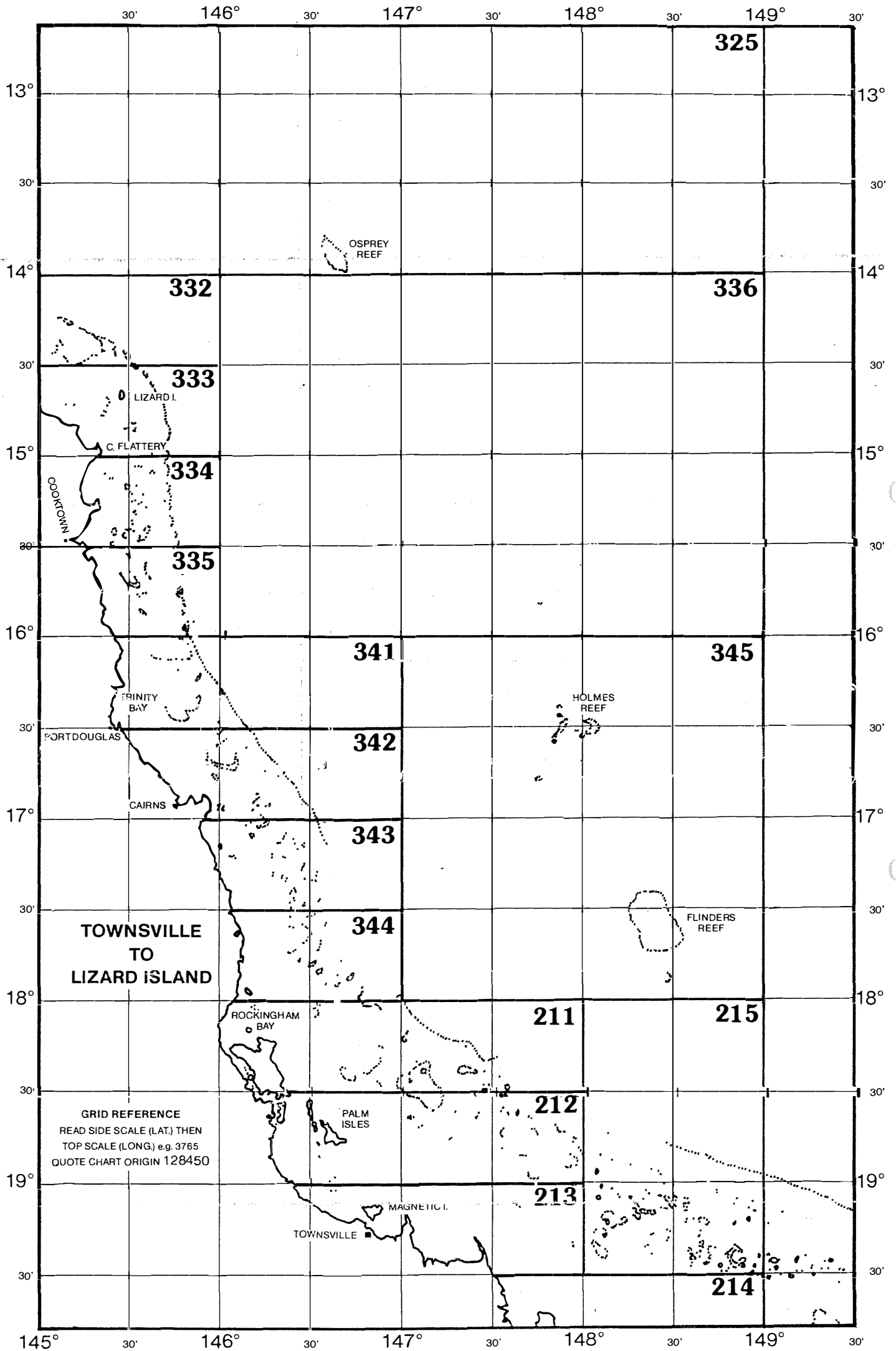
30' 30'

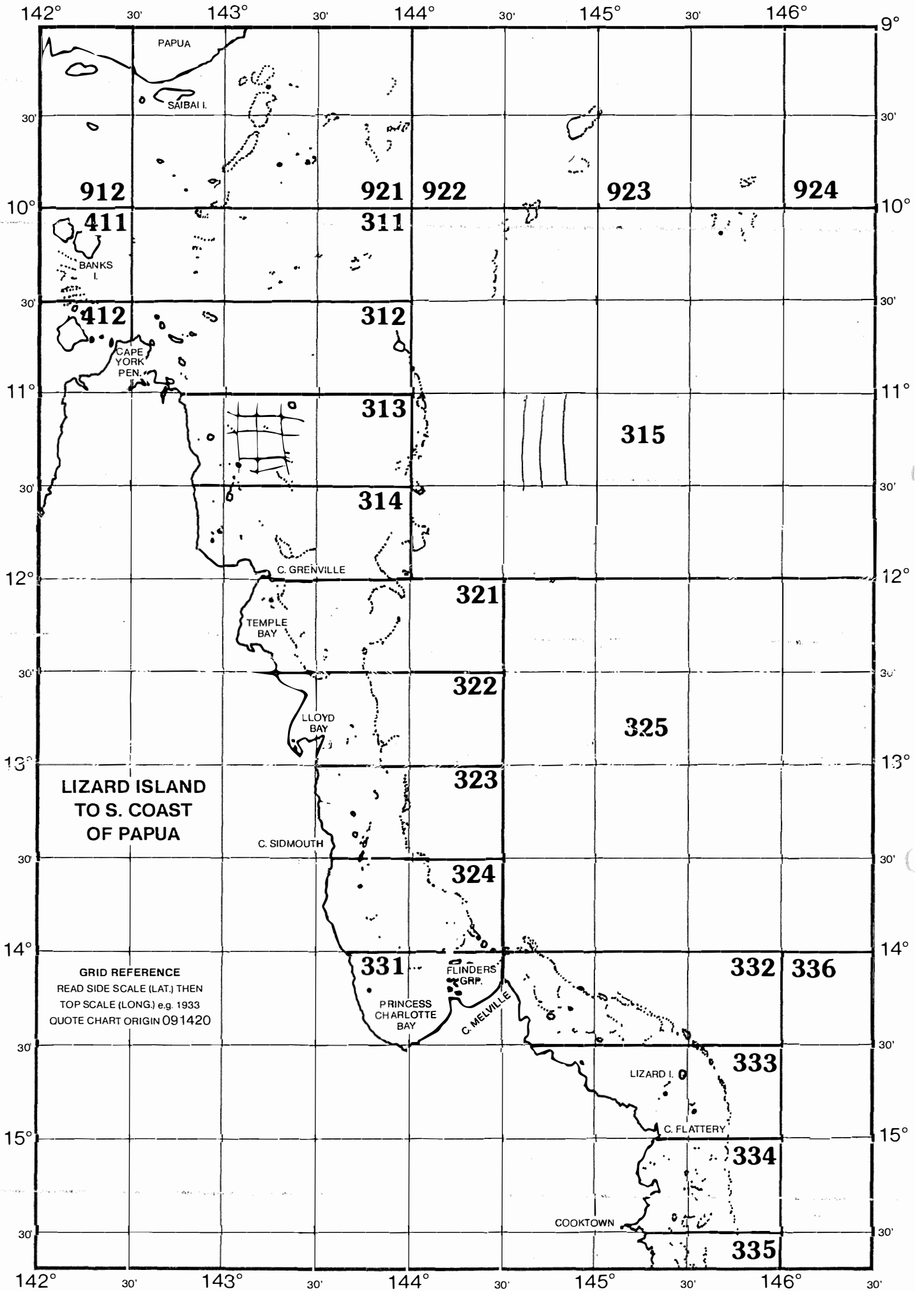
152° 30' 153° 30' 154° 30' 155° 30' 30°

GRID REFERENCE
 READ SIDE SCALE (LAT.) THEN
 TOP SCALE (LONG.) e.g. 6935
 QUOTE CHART ORIGIN 256530









PAPUA

SAIBAI I.

912

411

412

BANKS I.

CAPE YORK PEN.

921

311

312

313

314

C. GRENVILLE

TEMPLE BAY

LLOYD BAY

321

322

323

324

315

325

LIZARD ISLAND
 TO S. COAST
 OF PAPUA

C. SIDMOUTH

331

FLINDERS GRP.

PRINCESS CHARLOTTE BAY

C. MELVILLE

332

336

333

LIZARD I.

C. FLATTERY

334

COOKTOWN

335

MONTHLY CATCH RETURNS

Otter Trawling for Prawns, Scallops and Crustacea

NAME OF BOAT.....

REGISTERED BOAT MARKING.....

NAME OF OWNER.....

ADDRESS OF OWNER.....
.....

NAME OF MASTER FISHERMAN IN CHARGE.....

ADDRESS OF MASTER FISHERMAN IN CHARGE.....
.....

NOTICE TO THE OWNERS OF COMMERCIAL FISHING VESSELS WHICH FROM TIME TO TIME TAKE PRAWNS, SCALLOPS OR CRUSTACEA FOR SALE

You are hereby informed that by the authority of a Regulation under Section 104 of the Fisheries Acts, 1957-1962, you are required each month to complete one of the monthly return forms herein enclosed, and to forward same to the Chief Inspector of Fisheries on or before the 15th day of the month following.

You are also informed that the contents of these forms will be treated as confidential and will not be used for any purpose other than statistical examination and analysis that may be required for the biological management of the fishery to maintain its continued productivity.

(Sgd.)

CHIEF INSPECTOR OF FISHERIES.

