

Original contains color
plates: All DTIC reproductions
will be in black and
white

AR-006-815(2)

1990-91

DEPARTMENT OF DEFENCE (NAVY OFFICE)

AD-A252 245



DTIC
ELECTE
JUN 22 1992
S C D

REPORT

of the

HYDROGRAPHIC SERVICE

ROYAL AUSTRALIAN NAVY

for the year ended 30th June 1991

Issue Number 27

92-16338



APPROVED

FOR PUBLIC RELEASE



Commonwealth of Australia

92 6 19 051

REPORT
by the
Hydrographer, Royal Australian Navy

Commodore J W Leech RAN
for the year ended
30th June 1991

ISSN 0157 - 8766



Accession For	
NTIS GRAB	☒
DTIC TAB	☐
Unannounced	☐
Justification	
By	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A-1	

CONTENTS

	Component/ Sub-Component	Page
Letter of Submission		4
GEOGRAPHIC AND ENVIRONMENTAL SUPPORT	215000	5
HYDROGRAPHIC SURVEY	215010	7
Survey Operations		
Survey Plans		
Tidal Section		
Defence Cooperation Program		
Training, RAN Hydrographic School		
OCEANOGRAPHIC SURVEY	215020	15
Survey Plans		
Survey Ship (HMAS COOK)		
Maritime Environmental Data Acquisition & Quality Control		
NAVIGATION SERVICES	215030	18
Nautical Charting		
Navigational Services		
Information Services		
Chart Distribution		
Operational Facility, Canberra		
ENVIRONMENTAL SERVICES	215040	24
Australian Oceanographic Data Centre		
Naval Weather & Oceanographic Centre		
Training, RAN School of Meteorology		
DEVELOPMENT AND CORPORATE SERVICES	215050	32
Hydrographic Development		
Branch Development		
National and International Affairs		
Computing Services		
Corporate Services		
APPENDICES		
Appendix 1	Surveys Undertaken 1990/91	40
Appendix 2	Survey Equipment in Service	41
Appendix 3	Chart Production and Maintenance	42
Appendix 4	Chart Scheme Statistics 30 June 1991	43
Appendix 5	Description of New Charts Published	44
Appendix 6	Charts in Production	46
Appendix 7	Hydrographic Information Received 1990/91	48
Appendix 8	Chart Distribution	54
Appendix 9	Staffing Levels	55
Appendix 10	Hydrographic Service Organisation Key	57
ILLUSTRATIONS		61
DISTRIBUTION LIST		

Vice Admiral I. D. G. MACDOUGALL, AO, RAN
Chief of Naval Staff

Sir,

I have the honour to submit the Annual Report of the Hydrographic Service of the Royal Australian Navy. The report briefly describes the activities of the Service covering the period 1 July 1990 to 30 June 1991.

Notable achievements during the year include:

- * Continued implementation of Program Management and Budgeting.
- * Operations in South Australia and North Queensland in support of planned LADS trials.
- * Australia's adoption of the 12 nm Territorial Sea in November 1990.
- * Hydrographic and environmental support throughout Operation Desert Shield.
- * Decision to transfer Canberra based positions to Sydney.
- * Acquisition of additional office accommodation in North Sydney, and development of the User Requirement for relocation of the Hydrographic Office.
- * Changeover of the Hydrographer RAN.
- * Publication of Inspector General's Programme Evaluation of the Hydrographic Service.
- * Continued development of HIS and Hydrocomp.

Subject to your approval the Report will be forwarded to those individuals and organisations contained within the Distribution List.

I have the honour to be,

Sir,

Your obedient Servant.



J W LEECH
Commodore RAN
HYDROGRAPHER RAN

GEOGRAPHICAL AND ENVIRONMENTAL SUPPORT

Manager: HYDROGRAPHER RAN

Component 215000

The Hydrographic Service, RAN has two principal objectives. The first is to provide the ADF with the geographic and environmental data base, products and services to enable maritime forces to be deployed and operated to the optimum at strategic, tactical and national task levels of activity. Secondly, the Service exercises the CNS role of National Hydrographic Authority in support of the safe, economic and expeditious movement of the nation's maritime trade.

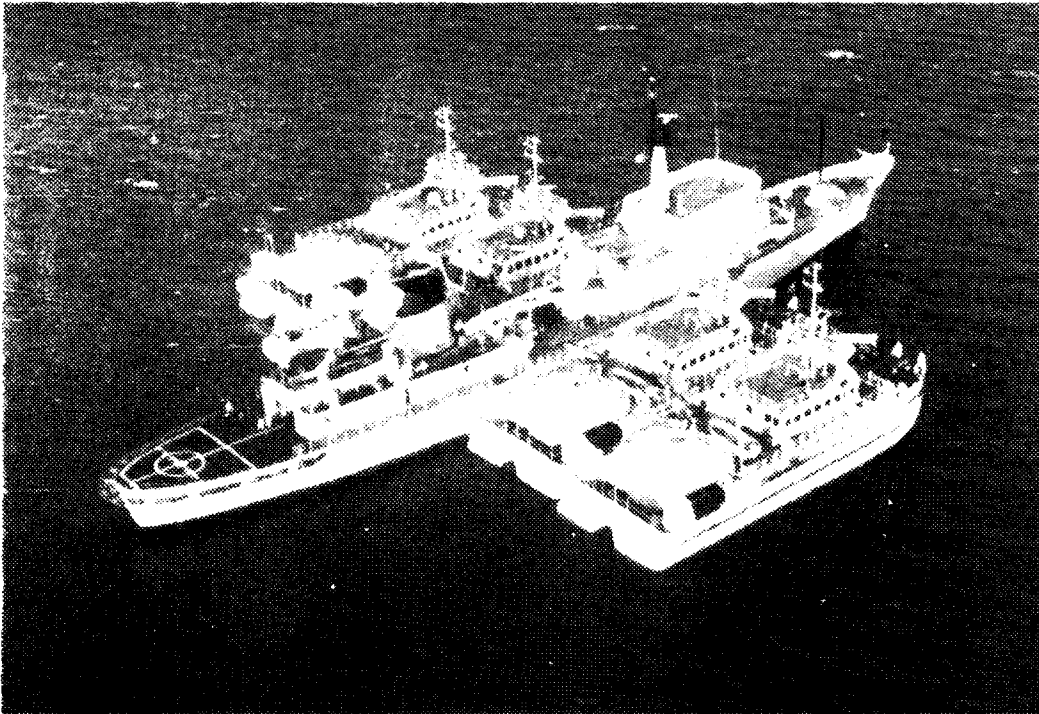
During 1990/91, emphasis has continued with 'management by program'. The core elements are national and defence hydrography, together with the defence operational applications of oceanography and marine meteorology described collectively as the Geographic and Environmental Support Component 215000 of the Navy's Maritime Operations sub program 210000.

Implementation of the component program is achieved through the five sub-components:

- | | |
|--------------------------------------|----------|
| * Hydrographic Survey | - 215010 |
| * Oceanographic Survey | - 215020 |
| * Navigation Services | - 215030 |
| * Environmental Services | - 215040 |
| * Development and Corporate Services | - 215050 |

The Annual Report is arranged to accord with this program structure.

Commodore J.W. Leech RAN was appointed Hydrographer in November 1990 on the retirement of Commodore J.S. Compton, AM, RAN.



HMA Ships MORESBY, PALUMA, MERMAID, BENALLA and SHEPPARTON

HYDROGRAPHIC SURVEY

Manager: Director Hydrographic Operations

Sub-Component 215010

HYDROGRAPHIC SURVEY

Sub-Component 215010

The assets of this sub-component are the field units of the Royal Australian Navy's Marine Science Force, together with a planning and tasking office in Sydney. Detailed reports of these units appear below.

The objective of this sub-component is to carry out hydrographic surveys in accordance with the five year survey program HYDROSCHEME. Management of the planning and tasking of these surveys is exercised at the Hydrographic Office in North Sydney. Surveys during the year have been progressed off Arnhem Land, off the north and south coasts of Papua New Guinea, off Adelaide, off Cairns and in Antarctic waters.

The four Survey Motor Launches (SML) have now been in service for some two years. In this time they have proven to be effective survey platforms providing flexibility in operations working either as pairs or in support of combined operations with HMAS MORESBY.

SURVEY OPERATIONS

HMAS MORESBY

The year for MORESBY has been productive despite the large number of major material defects and programming uncertainties caused by delays to the start of a long overdue refit. The major material problem was the continuing unreliability of electrical power generation capability. Many innovative measures, including the fitting of an emergency generator in the ship's garage, were required to keep the ship sounding.

The year commenced with the continuation of survey operations in the Wessel Islands. This survey included for the first time, joint operations with the four Survey Motor Launches. MORESBY was initially supported by MERMAID and PALUMA from late June. SHEPPARTON and BENALLA joined the survey task force in September, making history in assembling the greatest concentration of RAN surveying assets since World War II. Survey operations continued until October when MORESBY sailed for a visit to Singapore before returning to Perth in November. A short survey off Cape Naturaliste was undertaken before the Christmas leave period.

MORESBY sailed in February for Melville Island to conduct survey reconnaissance for Exercise Kangaroo 92. This included geodetic operations with the support of a Royal Australian Survey Corps detachment using GPS equipment. A further delay to the start of the refit resulted in MORESBY returning to the Melville Island area to support sounding operations by MERMAID and PALUMA. In May, MORESBY returned to STIRLING for refit leaving two SMB's and crews to continue sounding in support of the SMLs.

HMAS FLINDERS

The year has been one of mixed fortunes for FLINDERS during which major maintenance interrupted an otherwise busy programme of three extensive surveys in Papua New Guinea. The first of these surveys extended earlier RAN surveys in the Woodlark Island area and was conducted in October and November 1990. HI 159, in the vicinity of Nuakata Island, was started soon after with the objective of investigating alternative routes to Raven Channel. Due to the contrasting nature of seabed bathymetry and the existence of large numbers of hazardous shoals, operations were mainly limited to SMB sounding. The ship returned to Cairns for the Christmas period.

FLINDERS underwent a self work-up and seacheck in late January in preparation for her next deployment to Papua New Guinea. After an initial visit to Port Moresby the ship proceeded to the survey grounds in the Gulf of Papua. Except for a ten day SMP in Cairns, FLINDERS spent most of her time in the Gulf where the close proximity of Tropical Cyclone KELVIN and the unrelenting south east trades produced rough seas and nightly electrical storms which hampered progress considerably.

While FLINDERS operated some 50 nautical miles offshore, Survey Motor Boat (SMB) BRAMBLE was detached to Kerema Bay where a detailed survey was conducted of its approaches. During the period FLINDERS personnel were involved in the rescue of three local villagers whose dinghy had capsized in heavy surf at the entrance to the bay.

FLINDERS completed work in the Gulf of Papua in mid April and commenced refit in Cairns shortly thereafter.

HMA Ships MERMAID and PALUMA

MERMAID and PALUMA have undertaken four surveys and the first refit on the class of vessel during the year. A total of 185 days were spent deployed away from Cairns in the year which included 108 days refit. MERMAID and PALUMA have operated as a pair throughout the period.

HI 157, Wessel Islands, progressed during July, August, and early September 1990 with the principal areas of interest being the western approaches to the Cumberland Strait and northern approaches to Brown Strait. The survey was undertaken under the direction of HMAS MORESBY and also involved SHEPPARTON and BENALLA. MERMAID and PALUMA undertook their first overseas visit during August, with a four day visit to Ambon, Indonesia.

MERMAID and PALUMA returned to Cairns in September 1990 to commence the ships' first refit, which was undertaken at HMAS CAIRNS using contract labour exclusively. Following refit, set-to-work and acceptance trials were conducted in November and the ships sailed for HI 158, Supplement 1, a continuation of the Archer Point to Cape Kimberly survey. The survey was part of the continuing program to update charting of the Deep Draught Route through the Great Barrier Reef. Both ships returned to Cairns in late December only to be greeted by Tropical Cyclone JOY, and were forced to shelter in Trinity Inlet until Christmas Day, by which time the cyclone had passed Cairns.

A work up period in January 1991 preceded HI 162, North Queensland Laser Airborne Depth Sounder (LADS) Trials. The survey consisted of close sounding a series of benchmark areas which will be used to assess the accuracy and effectiveness of LADS.

After a brief maintenance period in Cairns during April, MERMAID and PALUMA returned to the North Australia area where HI 165 Melville Island was commenced. The survey concentrated on the northern approaches to Melville Island, particularly Snake Bay, and was continuing at the end of June 1991.

HMA Ships SHEPPARTON and BENALLA

On 1 July 1990, SHEPPARTON and BENALLA were alongside in Cairns preparing to deploy to the Hinchinbrook Island area to continue LADS trials area sounding. This work was carried out between 2 and 19 July, and the ships commenced an Assisted Maintenance Period on 23 July.

SHEPPARTON, with BENALLA in company, underwent a Workup and Seacheck before deploying to Arnhem Land in September. The ships arrived on the survey ground on 6 September, having carried out a check of the Torres Strait radio tide gauges. Both ships remained on the survey ground until December working with MORESBY and her Survey Motor Boats, sounding in Buckingham Bay and Brown Strait and making visits to Gove and Darwin. The ships returned to Cairns for Christmas. This period was interrupted by the close passage of Cyclone JOY, forcing the ships to seek shelter in the upper reaches of Trinity Inlet for four days.

SHEPPARTON and BENALLA departed Cairns on 14 January 1991 and proceeded south to resume surveys in South Australian waters in support of the LADS project. Work commenced in the Gulf of St Vincent on 6 February after a labourious passage in rough sea conditions. On completion of sounding in the Gulf and a Self Maintenance Period in Adelaide, the ships moved to Spencer Gulf to carry out benchmark sounding in the Thistle Island and Wardang Island ranges. This work was completed on 7 April and, after a farewell visit to Adelaide, the ships returned to Cairns, arriving on 13 May. An extended Assisted Maintenance Period commenced on 17 May.

Both ships experienced a productive year, working in Queensland, the Northern Territory and South Australia. Whilst the total area of sounding was relatively small, the effort required and expended to complete large scale LADS surveys was immense.

Hydrographic Office Detached Survey Unit (HODSU)

HODSU deployed from Sydney to HMAS CERBERUS on 12 August 1990 for a two week survey of the wharf and basin area adjacent to the new Seamanship School and Hanns Inlet. Personnel and a light utility boat from CERBERUS were used to assist survey operations.

In support of the continuing survey program in Antarctica, HODSU deployed to Hobart on 19 September 1990 to undertake the ANARE Station and Field Training Course conducted by the Antarctic Division for the 1990/91 season expeditioners. HODSU returned to Sydney to work-up SMB 3411 and survey equipment, prior to packing and shipping to Hobart. The five man team sailed from Hobart on 6 December 1990 embarked in M.V. ICEBIRD for passage to Casey Station where the Unit conducted a boat survey of the Approaches to Newcombe Bay and the Anchorage off Casey Station. The Unit returned to Australia on 22 March 1991. The results of the season's work will be incorporated in a new chart AUS 601.

In May 1991, the Officer in Charge HODSU conducted a reconnaissance for Operation Beachcomber 91. HODSU, and other Defence Force units, deployed in HMAS TARAKAN on 20 June and conducted Operation Beachcomber 91, returning to Sydney in July 1991.

SURVEY PLANS

The RAN surveying and charting plan, HYDROSCHEME, is developed through consultation with Department of Defence, maritime authorities and maritime commercial interests. The Hydroscheme is revised annually and promulgates the plan for the subsequent five years. Tasking of hydrographic units based on the programme is carried out by the Operations element of the Hydrographic Office.

Surveys Planned : July 1991 to June 1992

Melville Island NT; (Scale 1:25 000/1:50 000) HMA Ships MERMAID and PALUMA, June and July 1991. A survey of coastal waters off the northern coast of Melville Island. (Area 1 on Figure 12).

Coral Sea QLD; (Scale 1:100 000) HMAS FLINDERS, September to December 1991. A survey of the deep water approaches to Palm Passage. (Area 2 on Figure 12).

Great North East Channel QLD; (Scale 1:50 000) HMA Ships MERMAID and PALUMA, September to December 1991. A continuation of surveys to provide an alternative route to Vigilant Channel. (Area 3 on Figure 12).

Nuakata Island PNG; (Scale 1:10 000/1:25 000) HMA Ships SHEPPARTON and BENALLA, August to November 1991. A continuation of a survey of coastal waters in the vicinity of Nuakata Island. (Area 4 on Figure 12).

Groper Point to Margaret Cove WA; (Scale 1:50 000/1:100 000) HMAS MORESBY, January to April 1992. A continuation of surveys of the seaward approaches to Esperance. (Area 5 on Figure 12).

Nuakata Island to Lasienie Island PNG; (Scale 1:25 000/1:50 000) HMAS FLINDERS, January to April 1992. A survey of coastal waters off the northern PNG coast. (Area 6 on Figure 12).

North West Island QLD; (Scale 1:50 000) HMA Ships MERMAID and PALUMA, January to May 1992. A survey of coastal waters off the Queensland coast. (Area 7 on Figure 12).

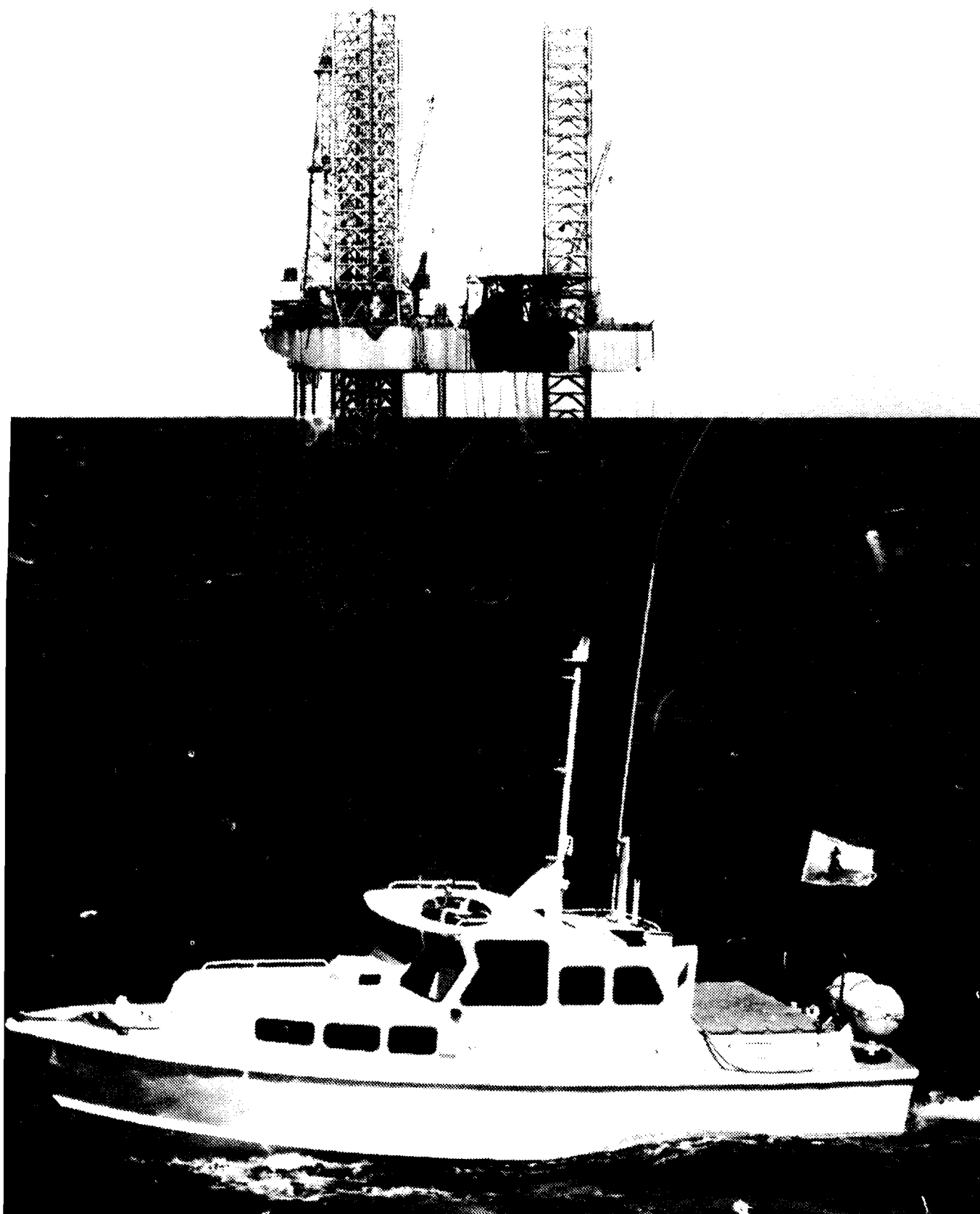
Halifax Bay QLD; (Scale 1:25 000/1:50 000) HMA Ships SHEPPARTON and BENALLA, January to April 1992. A survey of coastal waters north of Townsville. (Area 8 on Figure 12).

Stevens Island to Cape Stewart; (Scale 1:50 000) HMAS MORESBY, May to July 1992. A continuation of surveys off the northern coast of Arnhem Land. (Area 9 on Figure 12).

Coral Sea; (Scale 1:100 000) HMAS FLINDERS, May to August 1992. A continuation of surveys within the Coral Sea. (Area 10 on Figure 12).

LADS Trials QLD; HMA Ships SHEPPARTON and BENALLA, May to August 1992. A variety of surveys in support of optimisation trials of the LADS laser airborne depth sounder system in coastal waters off Townsville. (Area 11 on Figure 12).

Antarctica; (Scale 1:10 000/1:25 000) Hydrographic Office Detached Survey Unit, January to March 1992. A survey of the approaches to the Antarctic bases of Casey and Mawson. (Area 12 on Figure 12).



SMB WATERWITCH - South Pepper Oilfield

TIDAL SECTION

The Tidal Section's work includes production of Australian National Tide Tables (ANTT), support for cartographic work, survey operations, and special projects.

The 1992 edition of the ANTT has been compiled in a new format which includes tidal height predictions for 77 standard ports and one entry for predicted tidal streams. These predictions were produced by the National Tidal Facility at Flinders University (streams and 67 ports), Department of Marine and Harbours WA (7 ports), and Hydrographer of the Navy (UK) (3 ports).

The ANTT in the new format includes a more comprehensive listing of constituents for both primary and secondary ports (up to 21), and revised tidal level and time difference tables. This information will be updated regularly as new tidal data becomes available. The Tidal Section also assists with the production of tide tables for Solomon Islands and Vanuatu.

The supply of hydrographic survey tidal datum adjustments to the Hydrographic Office cartographic section, together with preparation of tidal information for survey operations remain the most time consuming tasks of the Tidal Section. Tidal Section has provided technical advice in selecting and trialling digital, bottom mounted tide gauges and current meters which will replace ageing analogue gauges in late 1991.

Development of a computerised tidal database is well advanced and Tidal Section now awaits delivery of its own computer workstation on which it will be installed. This database will facilitate all aspects of the Section's work.

Mean Sea Level measurement continues to be an important issue for Australia and the Pacific region, especially for research associated with the 'Greenhouse Effect'. The Tidal Officer is a member of the Working Group of the Permanent Committee on Tides and Mean Sea Level and is closely involved in establishing a network of high accuracy tide gauges dedicated to mean sea level measurement.

The Tidal Officer represents Hydrographer at Global Sea Level Observing System (GLOSS) conferences, and on the International Hydrographic Organisation Working Group on standards for tidal prediction programs produced by commercial organisations. Tidal Section maintains close links with its overseas counterparts, especially in UK, USA and Germany.

RAN TRAINING PROGRAM

Hydrographic School

Hydrographic training continued apace in 1990/91 with all courses running at full capacity. Officers, Senior Sailors and Junior Sailors courses were all conducted during the period. Overseas students came from New Zealand, Malaysia and the Solomon Islands. HYDLAPS technology is now fully integrated into all levels of training. Courses continue to be supported by two Survey Motor Boats and an extensive suite of surveying instruments.

An additional member has been added to the staff specifically to provide dedicated Training Development. An early result of this has been the audit of job employment patterns at sea, which in turn has provided the basis from which to provide relevant levels of training for each rank.

DEFENCE CO-OPERATION PROGRAM

Under the auspices of the Defence Co-operation Program (DCP), Hydrographic Advisers have been seconded to the Governments of the Solomon Islands and Vanuatu. Both advisers are Chief Petty Officer Survey Recorders. The Solomon Islands Hydrographic Unit was established in 1980 and the Vanuatu Hydrographic Unit was established in 1987.

Hydrographic Unit, Vanuatu

During 1990/91 the Unit conducted two surveys. The survey of the Approaches to Parray Bay proved very useful to both the Ports and Marine Department and local shipping agents. The second survey was a large scale wharf survey at Narovorovo in Maewo. A wharf survey at Litz Litz on Malakula was attempted in May but was cancelled due to bad weather. This time was used to carry out several leasehold surveys in the area. Surveys planned for the next 12 months are wharf surveys at Litz Litz, Lenakel on Tanna, Lamen Bay on Epi, Lolobuebue on Ambae and Ndui Ndui also on Ambae.

In February, the Unit took delivery of DCP funded equipment, including field observing, drafting and camping gear. This will enable the Unit to broaden the scope of future activities.

The first Vanuatu National Tide Tables were made available this year by courtesy of the Hydrographic Offices in both the United Kingdom and Australia, and were well received by the maritime community. Tidal data is sparse for a large proportion of Vanuatu and the Unit is selecting areas in which to collect data for analysis.

Hydrographic Unit, Solomon Islands

During 1990/91 the Unit conducted two surveys. The Noro survey in Western Province was carried out at a scale of 1:500 to assess the amount of dredging required to make the new fisheries wharf accessible to shipping. A survey of Mbokono Bay, Honiara was carried out at a scale of 1:500 to assist a feasibility study for the construction of a proposed patrol boat base.

A third survey is currently in progress in The Shortland Group, Western Province. The survey will be carried out at scales of 1:10,000 and 1:25,000, and the results will facilitate export of lumber by sea.

The arrival of the dedicated survey vessel SOLOMON OPHIR has been plagued with incident. In April 1990, she was washed ashore in a storm and severely damaged. The vessel is now in an extended repair period with an anticipated return to work in late 1991.

HYDROGRAPHIC SURVEY - Sub-Component 215010

Assessment Against Major Performance Indicators

The major performance indicator for this sub-component was for each MSF Unit to achieve 180 days at sea. Throughout the period an average of 56 days involved refit or intermediate docking. Achievement was:

Ship	Sea Days on Survey	Other Sea Days	Total Sea Days
HMAS MORESBY	110	25	135
HMAS FLINDERS	103	36	139
HMAS MERMAID	128	24	152
HMAS PALUMA	119	41	160
HMAS SHEPPARTON	97	38	135
HMAS BENALLA	105	45	150

OCEANOGRAPHIC SURVEY

Manager: Director Oceanography and Meteorology

Sub-Component 215020

OCEANOGRAPHIC SURVEY

Sub-Component 215020

The objective of this sub-component is to ensure appropriate quantities of qualified oceanographic data are available to meet ADF and civil maritime information needs.

With the decommissioning of the Oceanographic Survey ship HMAS COOK, on 31 October 1990, this sub-component now consists of a survey plans element as well as elements of the Australian Oceanographic Data Centre (AODC). Detailed reports of these elements appear below.

The development of the HYDROCOMP computer system, which when complete will provide the AODC with the facility to process oceanographic data for input into the Maritime Environmental Data Base (MEDB) and thus produce environmental data products, has progressed to the Data Base Acceptance Milestone and is on schedule for finalisation during the first half of 1992.

SURVEY PLANS

The decommissioning of HMAS COOK altered the direction of survey planning task. Alternative and more cost effective means of collecting oceanographic data have been investigated, in order to determine the most efficient mix and match of assets required to complete a comprehensive oceanographic survey over Australia's Northern Maritime Approaches during the next ten years. To this end an Oceanography Scheme is being developed, the outcomes of which will be resource dependant.

Also the acquisition of hardware to enhance the ability of selected RAN units to collect oceanographic data, has been reviewed. The computerised Sippican MK12 Oceanographic Data Acquisition System has been acquired to replace the obsolete analogue Sippican Mk2 Expendable Bathythermograph (XBT) System, presently fitted in major war vessels. The new system will not only measure the ocean's thermal profile but is capable of directly recording sound velocity and conductivity (by calculation salinity), thus providing a greater range of collected data parameters. The initial system was successfully trialled during 18-21 June 1991, in HMAS TORRENS. Further staffing is in train to acquire the Mk12 System for the Fremantle Class Patrol Boats, Mine Warfare Vessels and Survey Motor Launches.

Maritime Environmental Data Acquisition and Quality Control

The functions of this element are undertaken by the Australian Oceanographic Data Centre which manages the acquisition and quality control of specific data and information parameters of interest to the ADF. A number of programmes have been initiated to discharge the responsibilities of this element.

Data Acquisition

As an on-going exercise the AODC is acquiring data through existing bi-lateral agreements and is attempting to develop new agreements. At this stage formal or informal agreements exist with:

CSIRO, Division of Oceanography
USA, National Oceanographic Data Centre
Royal New Zealand Navy Hydrographic Service
Royal Navy Hydrographic Service
Japan Oceanographic Data Centre
Antarctic Division

Quality Control

A considerable development effort has been initiated within AODC to design and develop a sophisticated data quality control facility that will be used to check and alter, if necessary, data before it is stored in the operational databases of HydroComp. The quality control facility will use rules and guidelines developed during discussions with the CSIRO as well as the principles inherent in GTSP quality control and other relevant data management projects.

OCEANOGRAPHIC SURVEY

Sub-Component 215020

Assessment Against Major Performance Indicators

Without a dedicated Oceanographic platform, positive action was undertaken to access RAN and Commercial units for adhoc environmental data collection. Data acquisition and exchange via national and international sources continues.

NAVIGATION SERVICES

Manager: Director Hydrographic Operations

Sub-Component 215030

NAVIGATION SERVICES

Sub-Component 215030

The elements of the Navigation Services sub-component are involved in the archiving of information, production and distribution of nautical charts, provision of updating services, and supply of navigational information in non-chart (textual) form.

The year has been unremarkable, and below normal production figures have resulted. Some useful enhancements have been made to the Autochart production system, but unreliability of the system has had a detrimental impact on production. Limited availability of experienced staff has continued to be a problem. Detailed element reports are set out below.

NAUTICAL CHARTING

Chart Production and Revision

Seven new charts were published during the year. Four new editions were published to meet the requirement for major revision of existing charts. Details of new charts and new editions published are given at Appendix 5.

Although the number of new charts and new editions published during the year is less than the previous period, factors such as inexperienced staff, incapacity through repetition strain injury and frequent unserviceability of the Autochart system contributed to the low level of production. However, the total production effort throughout the year is not adequately revealed in these statistics; twenty three charts, several of a complex nature, are in advanced stages of production and will be published over the ensuing months.

The national charting program was reviewed in May 1991. The program outlines significant charting requirements identified by categories and areas of navigational importance. There are large scale port charts (new editions), Australia and Papua New Guinea coastal navigation charts, charts of Australia's offshore territories, International charts, recently surveyed areas, new coastal developments and military exercise areas. The division of work in the program is approximately 70 percent Australia, 20 percent Papua New Guinea and 10 percent International. There is an emphasis on northern Australia, reflecting the current hydrographic survey program.

Two significant changes to charting practice were approved by the Hydrographer in the latter part of 1990:

- a. The World Geodetic System (WGS) horizontal datum for all new charts was adopted in lieu of the Australian Geodetic Datum (AGD).
- b. Following consultation with national Port Authorities, Lowest Astronomical Tide (LAT) was adopted as the vertical chart datum in lieu of Indian Spring Low Water (ISLW) for all large scale and coastal navigation charts. Although LAT was introduced in 1971, it has been implemented by gradual application to specific charts and coastal areas. All new editions are converted to LAT as they are compiled.

The hydrographic digital chart data base now contains 110 chart files ranging in scale from 1:50 000 to 1: 75 000 (port charts), 1:150 000 to 1:300 000 (coastal navigation charts), and 1:1M to 1:10M (route planning charts). The data base information comprises topography, hydrography and bathymetric surveys, navigation aids, nomenclature, maritime boundaries and port information.

Chart Maintenance and Printing

The chart maintenance section is responsible for the maintenance of the chart reproduction material (REPMAT) used in the printing process, and for arranging printing schedules. Low volume reprint runs are preferred, in order to reduce the number of corrections outstanding on any chart. During the year, 175 revised charts were sent to the printer and 103 charts were reprinted without revision.

The maintenance section also compiles chart correction blocks and prepares special charts and graphics for Defence users. During the year 38 blocks and 56 graphics were completed.

The correction of published chart stock, normally managed by hand correction services, has been successfully enhanced by the application of screen printing methods. 123 published charts, requiring over 500 corrections (issued by Notices to Mariners) have been corrected by screen printing, ensuring that navigational information has been accurately and promptly disseminated to the marine community. It is a Hydrographic Office objective that no chart shall be issued with more than three corrections outstanding. This is now being achieved for 95 percent of inventory.

Since the days of the early marine explorers Australian waters have been surveyed and charted by the British Admiralty. Although the majority of the British Admiralty (BA) charts have been superseded by Australian products, an arrangement was made in January 1991 with the Hydrographer of the Navy (UK), to assimilate the remaining BA charts in the Australian area into the Australian chart series. Twenty one BA charts will be adopted as Australian charts during 1991 followed by the remaining thirteen in 1992. This process will complete the planned take over of all BA charts identified and compatible with the planned Australian chart scheme.

Staffing and Training

Chart production has continued to be affected by a shortage of qualified and experienced drafting officers. The work is specialised and positions cannot easily be filled by external recruitment. Current manpower resources, 41 in number, have been distributed to provide recognised expertise in particular charting applications, and an equal balance of experienced and inexperienced personnel within each major section. A number of junior members of staff are undertaking part time study, and currently are gaining experience through employment in the preparation of small compilations (blocks) in the chart maintenance group. In-house instruction in procedure and nautical charting practice was provided to inexperienced staff by senior personnel acting as cartographic advisers.

Six drafting officers are currently studying Survey Drafting Associate Diploma courses, at various stages of completion. One senior draftsman is undertaking Bachelor of Applied Science studies. Four trainee drafting officers are involved in various levels of studies for the Survey Drafting Associate Diploma. One drafting officer is undertaking a course in Land Information Systems. One supervising drafting officer involved in automated cartographic systems attended two short courses of specialised training and instruction in Geographical Information Systems (GIS).

Two drafting officers spent short periods at sea attached to RAN survey ships for familiarisation with hydrographic surveying and the use of HYDLAPS for digital collection and processing of survey data.

NAVIGATION SERVICES

Notice to Mariners

The Notice to Mariners section is responsible for issuing weekly booklets of chart corrections, to enable chart users to keep their charts up to date. Some 1,700 Notice to Mariners booklets are dispatched each week. The section has continued to receive a steady flow of data, resulting in 699 Notices being issued during the year.

Statistics for the 1990/91 period are as follows (1989/90 in brackets):

Notice to Mariners issued	699	(746)
Block corrections for charts	38	(34)
Notes for charts	21	(51)
Reproduction of BA blocks	1	(3)
Reproduction of BA notes	3	(14)
Reproduction of NZ blocks	1	(0)
Reproduction of NZ notes	13	(2)
Hydrographic notes from HMA Ships	79	(78)
Hydrographic notes from other sources	45	(53)

Vessels rendering five or more Hydrographic Notes during the year were:

HMAS BRUNEI	9
HMAS BUNBURY	8
HMAS GAWLER	7
HMAS FLINDERS	6
HMAS CESSNOCK	6
MV HATTRICK	6
HMAS JERVIS BAY	5
HMAS RUSHCUTTER	5

Sailing Directions

The responsibilities of the Sailing Directions sub-section include gathering and editing of material for the compilation of a series of volumes of sailing directions, covering the Area of Australian Charting Responsibility; advising on matters pertaining to maritime boundaries; and dealing with maritime nomenclature.

The proposed coverage of Australian produced sailing directions remains as reported in the 1989/90 Annual Report. During this year effort has been directed towards completing the volume covering the coast of the Northern Territory.

During the year the sub-section was provided with the initial outfit of PC based equipment required to compile, edit, manage and archive data relating to the three areas of responsibility.

During 1990/91, Sailing Directions data has been extracted from Office records and formatted for all Hydrographic Instructions issued during the year. This data has been issued to the relevant unit for field additions and field editing. All Returns of Survey received have been examined during the Quality Control procedure with particular reference to Sailing Directions.

It became apparent whilst compiling the Australian Sailing Directions that available maritime glossaries do not reflect Australian usage. An inhouse glossary has been established to correct this deficiency.

Maritime Boundaries

Australia adopted a 12 mile Territorial Sea in November 1990. Although the Hydrographic Service will continue to show the gazetted straight baselines only on the 1:300,000 scale chart series, the introduction of the new limit resulted in a large number of enquiries from other authorities.

Maritime Nomenclature

The Sailing Direction Officer attended the meetings of the Committee on Geographic Names in Australia, and the United Nations Group of Experts on Names, South East Asia, held in Perth in August 1990. Progress was made towards publishing the Toponymic Guidelines for Australia and a glossary of geographic terms.

All new charts and new editions have had nomenclature researched and verified. A number of new geographic names within territorial limits were adopted. The help and assistance of the State and Territory Nomenclature and Geographic Names Boards has been greatly appreciated, however difficulties continue with names in Papua New Guinea as no nomenclature authority is active for that area.

The programme to rationalise the nomenclature used in the Torres Strait area continues. Of 750 named features identified, 250 have alternative names or variations in spelling. This project will continue with the assistance of the Queensland authorities.

The International Hydrographic Bureau supplied a copy of the IHO/IOC BP 0008 Gazetteer of Geographical Names in digital form, which is now used as one of the primary references of the section.

The bathymetric Offshore Resource Map Series, a joint project of the Bureau of Mineral resources, Bureau of Rural Resources and the RAN Hydrographic Service, has required nomenclature verifications of the map compilations. This map series at a scale of 1:1,000,000 depicts significant detail and a large number of new names of offshore features has resulted. Each feature name has been processed and registered with the GEBCO Sub Committee on Geographic Names.

INFORMATION SERVICES

The Hydrographic Office Information Services Element manages both hydrographic data and general library resources. The section holds hydrographic surveys of RAN and non-service origin, geodetic information, satellite imagery and aerial photography, and supports these with specialist library resources. The section's major task is to support surveying, charting and oceanographic activities in the Australian charting area both from in-house resources and by external search activities.

Requests for the supply of original RAN survey data has been noticeably increasing over the past few years. Non-Service data held by the Hydrographer is not released to third parties. Fisherman, engineers, authors and others are continually seeking source data to supplement the existing charted information. This has resulted in an increased load on existing resources. Data is supplied on a user pays or data exchange basis.

CHART DISTRIBUTION

The Chart Distribution Centre continued to function as the national distributor of marine navigation charts. Appendix 8 shows that, for the third year in a row, the revenue from sales has been close to one million dollars despite the depressed economy. This year, the value of issues to the Defence Force has been included in the figures, in order to show the total value of services provided by the Hydrographic Office.

The section responded to the increased activity in supplying charts to support RAN vessels and Maritime Headquarters during Operation Damask.

The Manager of the Chart Distribution Centre visited 14 agents in the Far North of Queensland in May 1991. These visits were intended to ensure that adequate services are available to the public, to investigate the granting of new agencies, and to obtain opinions on the service provided to agents by the Office.

The Distribution Centre continues to deal with requests for permission to reproduce published data in books and magazines. Several requests have been granted in the interests of public safety.

OPERATIONAL FACILITY CANBERRA

The Operational Facility, located in Canberra, comprises the assets transferred from the Division of National Mapping Bathymetric Mapping Programme to the Department of Defence Hydrographic Charting Program in 1988.

The Program Evaluation conducted by the Inspector-General Division during 1990/91 recommended that the Facility be relocated to Sydney and action was taken to this effect. The agreement of the Maritime Commander to the compulsory transfer of staff positions was obtained in June 1991. As a result it is expected that activity in the Canberra Office will cease during FY 92/93.

During the year work continued on bathymetric map compilation and printing with 10 compilations being completed and 10 maps printed. The status of the program is shown at Figure 11.

Work was commenced on the compilation of Charts Aus 163, 302, and 303.

NAVIGATION SERVICES - Sub-Component 215030

Assessment Against Major Performance Indicators

The major performance indicators for this sub-component in the year under report are:

- a. Maintenance of screen printing and reprint cycles to ensure 95% of charts have 3 or less corrections outstanding.
- b. An annual production rate of 2 new products per person employed in the chart production section. 1.1 new products were achieved during the reporting period.
- c. Continued compilation of an Australian series of Sailing Directions. During this year effort has been directed towards completing the volume covering the coast of the Northern Territory.

ENVIRONMENTAL SERVICES

Manager: Director Oceanography and Meteorology

Sub-Component 215040

ENVIRONMENTAL SERVICES

Sub-Component 215040

The two elements of this sub-component, through the activities of the Australian Oceanographic Data Centre (AODC) and the Naval Weather and Oceanographic Centre (NWOC), are involved in the provision of maritime environmental products and services in support of the ADF's maritime environmental needs, as well as to meet national and international responsibilities.

The past year has seen the Naval Meteorological (NAVMET) system accepted into Naval Service in the NWOC, and the capabilities of the Man Computer Interactive Data Access Computer System (MCIDAS) enhanced. Through these systems the centre was able to provide comprehensive meteorological/oceanographic support to the Maritime Command Centre during Operation Damask.

AUSTRALIAN OCEANOGRAPHIC DATA CENTRE

Within the Hydrographic Service the Australian Oceanographic Data Centre (AODC) is responsible for the acquisition, quality control, management and dissemination of oceanographic data and information in support of Australian Defence Force (ADF) maritime operations and marine related activities within the civilian community. The AODC also operates as Australia's National Oceanographic Data Centre and is responsible for the archival of oceanographic data in the national interest.

General

The AODC has undergone significant changes during 1990/91. These changes relate particularly to the continuing implementation of computing facilities which is being driven specifically by the HydroComp computer system project.

The number of civilian positions has remained constant throughout the year which has resulted in some difficulties in meeting the number of tasks identified under Program Management and Budgeting. The uniformed complement has increased by one with the filling of an ABMET billet.

The transition to Program Management and Budgeting has progressed smoothly with the greatest impact being the necessity of developing a more detailed management strategy. All work tasks are now documented and priorities allocated according to availability of resources, and the importance of the task within the element's program.

A number of steps have been made to consolidate the process of data acquisition from both national and international sources. Various meetings were attended that will facilitate the acquisition of data from these sources.

Bathothermal Data

The AODC received 3114 Expendable Bathothermal (XBT) profiles from RAN ships which is an increase of over 600 from last year. This is a reflection of the developing interest within the RAN of improving the oceanographic databases. Some 816 XBT's from HMAS COOK and other Fleet units were rendered in a digital form, simplifying the task of entry into the main data bases. However, the digital data has not been quality controlled because the necessary software systems are not yet in place.

Analogue XBT data provided by RAN vessels undergoes quality control checking by AODC staff. Data is rejected if any system malfunction is detected. The overall success rate of Fleet Units has improved since last year. The 1990/91 Fleet acceptance rate has risen to over 80%. This improvement may be due to the use of newer probes which were obtained from the manufacturer in June, 1990.

During the year 2,679 analogue XBT traces were forwarded to the United States National Oceanographic Data Center (NODC) in Washington for electronic quality control and digitisation. This data consisted of data from both the Royal Australian and New Zealand navies. Approximately 200 XBT observations in digital form (recorded by the MK9 XBT system) were also forwarded to NODC for processing and quality control.

Data Holdings

The quantity of oceanographic data held by AODC has grown considerably during the year. Data has been acquired through a number of bi-lateral agreements from both national and international organisations. The quantities of digital data held as of 30 June, 1991 are :

Bathothermal data (MBT and XBT)	654,358	observations
Nansen cast data	71,288	observations

It is likely that there will be a number of duplicate observations within the bathothermal database which have arisen because overlapping data sets have been acquired from different sources. The quality control software that is being developed within the HydroComp system environment will largely overcome this duplication.

A large quantity of XPT and CTD data has been received from CSIRO, Division of Oceanography. This data is from the RV FRANKLIN and the RV SPRIGHTLY, and has been provided to AODC for inclusion in the national oceanographic data archive as part of a bi-lateral agreement. The data consists of 1157 XBT's and 3197 CTD's. This data will be added to the temporary HydroComp database as soon as a data translator has been developed.

Various data sets have been received on CD ROM and will be included in AODC's data inventories. This data consists of :

NODC Pacific Ocean Temperature and Salinity Profiles (1900 - 1988)

Tropical Ocean Global Atmosphere (TOGA) program data set for 1985 and 1986.
This set contains barometric pressure, surface air temperature, dew point temperature, sea level, sea surface temperature, depth profiles of temperature and current.

Other data sets acquired by AODC from the US NODC and the British Oceanographic Data Centre have included:

- XBT data (five magnetic tapes)
- MBT data (three magnetic tapes)
- CTD/STD data (one magnetic tape)
- Nansen data (two magnetic tapes)
- Southern Ocean Atlas (Temperature and Salinity data)
- World Wide Ocean Colour/Transparency data
- Global gridded bathymetry data
- Ship and Institution codes

Work is continuing on the development of a data management system for the large quantities of data collected by HMAS COOK.

Services

The AODC is responding to an increasing number of requests for environmental information and oceanographic data from both defence and civil agencies.

A number of Environmental Briefs have been produced for Defence purposes with the most significant of these being the brief produced to support Australian participation in Operation DAMASK. The AODC also assisted coordinating the development of an interim version of the Tactical Environmental Support System (TESS) for use in the Gulf.

The AODC and Computing Services Sections of the Hydrographic Service together with personnel from Maritime Systems Division, Australian Joint Maritime Warfare Centre and the Commonwealth Scientific and Industrial Research Organisation provided environmental support for the Australian deployment in the Gulf region. Approximately 600 manhours from within the AODC were directed to this effort over a period of ten days and resulted in a comprehensive 90 page document which described in detail the environmental conditions expected in the September, October, and November period. A follow on brief of almost 200 pages was produced to cover the full 12 month period. A prototype version of TESS was developed and was used operationally during the Gulf conflict. Valuable feedback on how well the system performed was obtained which has assisted in its further development.

A number of other briefs have been produced in support of exercises to assist in defence projects and for operational planning purposes. Requests from Navy, RAAF, and the Defence Science and Technology Organisation (DSTO) were completed.

The AODC continued to provide data and information to the civilian community. Information has been supplied to a wide range of organisations for a variety of purposes. Some of these have included:

Data for the Institute for Polar and Marine Research in Germany as part of a World Ocean Circulation Experiment (WOCE) activities.

Caltex Oil Co. to support oil spill research.

Current information for the Crown Solicitor's Office.

A variety of data for the Ocean Sciences Institute.

Data for Bureau of Meteorology Research Centre to assist in model development.

Department of Geology, Australian National University

Department of Primary Industries, Northern Territories Fisheries Branch

Australian Institute of Marine Science

Wind and current data to support an America's Cup challenge in San Diego.

International Activities

The AODC has continued to be involved in a number of international activities. These activities are of considerable benefit in providing the AODC with access to data sets covering Australia's area of interest that are held by other countries or have been developed as a result of international and regional scientific programmes. A description of these activities follows.

Integrated Global Ocean Services System (IGOSS)

AODC has continued to contribute to the IGOSSE programme through the Australian Specialised Oceanographic Centre (SOC), which is a joint venture with the Bureau of Meteorology. The SOC undertakes the quality control of real-time XBT data and then produces and distributes monthly management products including data distribution charts.

Global Temperature/Salinity Pilot Project (GTSP)

The Head, Science and Oceanography together with the Head, Computing Services attended the first meeting of the Steering Committee for the Intergovernmental (IOC) / World Meteorological Organisation (WMO) Global Temperature and Salinity Pilot Project held in Brest, France in September, 1990. This meeting established the operational aspects of the project and finalised the Implementation Plan which was developed by AODC. Data quality control procedures and data flow aspects were also addressed.

To more fully participate in GTSP, the AODC is establishing links to the Australian Academic Research Network (AARNET). This network will provide direct access to data centres in the USA and Canada, the main GTSP management centres. When this capability becomes operational in late 1991 AODC will be able to acquire data in a more realistic time frame than is presently available. The data link will also enable AODC to undertake the management of the data flow of the Australian contribution to the GTSP and WOCE quality control systems.

It is anticipated that the GTSP will become the single most important source of oceanographic data for the AODC and continued involvement in this program is seen as a cost effective method of expanding the AODC's existing data holdings.

Japan Oceanographic Data Centre (JODC)

A scientist from the Japan Oceanographic Data Centre (JODC) completed a 12 month exchange at AODC in March, 1991. The exchange has considerably improved the level of cooperation between AODC and JODC which will facilitate the future exchange of data between the two centres.

World Ocean Circulation Experiment (WOCE)

The AODC has continued to be involved with the development of a data management and quality control system to support the Australian contribution to WOCE. A number of planning options have been investigated in conjunction with the CSIRO, Division of Oceanography and the Bureau of Meteorology Research Centre. Involvement with this program will provide AODC with access to large, scientifically validated thermal data sets.

WESTPAC

The Head, Science and Oceanography was granted six months leave without pay to undertake a consultancy on behalf of the Intergovernmental Oceanographic Commission directed towards the establishment of the IOC/WESTPAC Sub-Commission in Bangkok. The benefits to Defence of this effort relate to the development of networks in the marine science communities of South East Asia. Improved levels of cooperation will result in better access to oceanographic data and information that can be used to develop the AODC's databases.

HydroComp Computer System

The development of HydroComp is continuing. A series of prototypes have been successfully developed to demonstrate the viability of specific software methodologies necessary to meet the functionality requirements of the system. Three prototypes were developed covering the database design, interactive graphics editor and output systems design. The development of the database structure has been completed and is presently undergoing testing.

The project is slightly behind schedule, however the work completed to date indicates that HydroComp will be an extremely powerful and flexible system. The ability of AODC to manage and process digital oceanographic data will be significantly enhanced when HydroComp becomes operational in early 1992.

NAVAL WEATHER AND OCEANOGRAPHY CENTRE

General

The role of the Naval Weather and Oceanography Centre (NWOC) is to provide meteorological and oceanographic (METOC) products, services and training that permit ADF maritime users to tactically exploit the submarine, surface and air warfare environments. The relocation of the RAN Applied Oceanography Centre (AOC) within the NWOC during the year has centralised manpower resources and has allowed the integrated development of the Tactical Environment Support System (TESS). The NWOC is now responsible for the conduct and /or coordination of all RAN specialist and non specialist METOC training, as well as TESS training for maritime users, and the production of TESS operator manuals.

Operation DAMASK highlighted the requirement for contingency access to environmental information for areas other than the Australian Area of Direct Military Interest (ADMI). With the exception of satellite imagery, such information including prognostic data up to 120 hours ahead, can now be rapidly acquired by the NWOC through its interactive computer systems. The problem of obtaining relevant satellite imagery is currently being addressed, along with the requirement to convey METOC products such as charts and satellite imagery to users in as close to real time as possible.

The NWOC is now linked by data line to the Maritime Command Centre (MCC), enabling the MCC to access through the Naval Meteorological (NAVMET) system real time and prognostic information on a continuous basis.

Funding has been provided to acquire a Digital Facsimile (DIFACS) service from the Bureau of Meteorology which will replace the present analogue system. DIFACS will provide the NWOC with routine meteorological satellite imagery and graphical prognostic products as well as access to The BOM's Australia wide weather radar network.

Manpower

Once the recently approved fourth forecaster billet is filled, probably during early 1992, the Centre will be manned by a forecaster on a 24 hour basis so permitting a more enhanced service to be provided to maritime units. The relocation of the Upper Air Section monitoring equipment to within the physical confines of the NWOC has allowed the transfer of one senior sailor's billet to the RAN School of Meteorology to satisfy the increasing demands for specialist training.

Environmental Output

A favourable response to the trial of formatted forecasts for Minor Fleet Units has resulted in this

style being adopted as standard for these units, resulting in a significant reduction in associated communications time. However following an appropriate trial the inference section of forecasts for remaining recipients has been retained. Meanwhile, as the issue of routine 24 hour forecasts proved to be impracticable and the NWOC has reverted to making all forecasts of 12 hours validity.

The volume of signalled environmental information for 1990/91 has remained at a similar level to 1989/90 totalling nearly 15500. The accuracy for both maritime and aviation forecasts has exceeded 80%.

As a result of Operation DAMASK environmental data relating to the Gulf area was provided to the Maritime Command Centre (MCC), the Defence Intelligence Organization (DIO) and units in the operational area. Throughout the year environmental support was also provided to 92 Wing RAAF for TAMEX exercises, to units of various nationalities for TASMANEX, to the Maritime Intelligence Centre, as well as to RAN Tactical Electronic Warfare Support Section (RANTEWSS) to support research into electromagnetic radiation propagation.

RAN Applied Oceanography Centre (AOC)

The RAN Applied Oceanography Centre was relocated to the NWOC from the Australian Joint Maritime Warfare Centre in December 1990.

During the period TESS was further developed resulting in operational trials being conducted by RAAF 92 Wing and RAN surface and sub-surface units. TESS was used to forecast anomalous propagation conditions, along with radar, Electronic Surveillance Measures (ESM) and communication ranges during Operation DAMASK. All major surface units will be fitted with TESS coincident with installation of the Mk.12 digital XBT system during the next year. Operator manuals and training for users will be provided as part of this installation.

Work carried out in the AOC in conjunction with the Bureau of Meteorology, Melbourne has led to the development of computer programs which permit the processing of satellite sensed data to produce images of sea surface temperature (SST). The data is provided via the Man Computer Interactive Data Access System (MCIDAS) and at present augments, but will ultimately replace, the data provided by the CSIRO Division of Oceanography, Hobart. The software allows the NWOC to determine SSTs over Australia's area of interest and to locate the major oceanographic features, such as fronts and eddies at a spatial resolution of four kilometres.

The Officer-in-Charge of the AOC has conducted training in oceanography, sonar range prediction and the tactical utilization of the environment to Basic and Advanced UC and UCSM Courses, Advanced RP Courses, Principal Warfare Officers Courses and personnel from the Australian Submarine Squadron and the RAN Tactical EW Support Section. This training will be expanded to cover the operation and tactical use of TESS.

Oceanography

Demand for Sonar Range Prediction forecasts (AUSRAPS) has decreased in the last 12 months mainly due to the RAAF becoming self sufficient in the production of these forecasts. The main users of this product are now submariners. The capability has been developed to produce coded AUSRAPS within the NWOC rather than having to rely on external agencies for this function.

The oceanographic analysis of the Southwest Tasman Sea has continued utilizing CSIRO sourced satellite imagery the receipt of which has been enhanced through establishing, on a trial basis, a direct communications link with the NWOC.

Analysis of the Southeast Indian Ocean's Leeuwin Current has not yet been undertaken because of data limitations. However with the recently acquired ability to access sea surface temperature through MCIDAS it is expected that this analysis will commence later in 1991. A Meteorological/Oceanographic buoy has been deployed off Rottnest Island since May providing surface as well as sub-surface temperatures (to 100m) in near realtime .

Communications

The NWOC has been registered as a DISCON user which will permit the Centre's output to be more effectively passed to maritime units. In the near future the NWOC will be linked through DISCON to its main data source, the Bureau of Meteorology. This sophisticated communications link will provide integrated communications at a significantly faster speed for NAVMET, MCIDAS and DIFACS data.

RAN School of Meteorology (RANSOM)

The primary role of RANSOM is to conduct meteorology training for specialist meteorological and other personnel in the ADF. Major courses include the Military METOC course for RAN graduates of the Bureau of Meteorology's forecaster course, the basic Meteorological Observer course, and the Advanced meteorology course, which is a prerequisite for promotion to Petty Officer. Other training includes courses for the Army's Parachute Training School (PTS), the RAN Long Navigation Course, Small Ships flight Commanders course, EXAC phase 3, Foreign Officers EXAC as part of the Defence Co-operation Program (DCP), Basic Aircrew course, Petty Officer Aircrew, and Electronic Warfare Systems operators on the HS 748 Flight.

The major RANSOM throughput during the last 12 months has been one Military METOC course, two basic Meteorological Observer courses, two Advanced Meteorology courses, three Upper Air Qualifying courses and five Upper Air Conversion courses. Additional commitments have included:

the rewriting and updating of training notebooks for major courses; and

redevelopment of the Military METOC and basic Observers courses as a result of the introduction of the NAVMET and TESS computer systems.

The Foreign Officers EXAC course, conducted in February 1991, was tailored to the requirements of the individual nations represented. Students from the following countries attended:

The Philippines (2)
Solomon Islands (2)
Western Samoa (1)

ENVIRONMENTAL SERVICES - Sub-Component 215040

Assessment Against Major Performance Indicators

The major performance indicators for this sub-component in the year under report are:

- a. Maximise output from the NWOC to achieve all ADF requirements.
- b. Effective system management of oceanographic data and products to meet ADF requirements through the introduction of Hydrocomp. The system has been partially installed and is under evaluation to ensure viability of specific software methodologies necessary to meet the functionality requirements.

DEVELOPMENT AND CORPORATE SERVICES

Manager: Director Co-ordination and Development

Sub-Component 215050

DEVELOPMENT AND CORPORATE SERVICES

Sub-Component 215050

The Development and Corporate Services sub-component provides the forward planning and co-ordination necessary to ensure the delivery of maritime geographic and environmental information under Navy Program Component 215000, for defence and national requirements. The information requirements over the vast area of Australian maritime interest, places significant emphasis upon the technological capabilities for acquiring the necessary information and the systems technology necessary for processing and delivery.

The activities of the Branch in acquiring information involve considerable liaison and coordination with both national and international agencies in the conduct of operations, creation of standards and the monitoring and promotion of Australia's interest in the collection of maritime geographic and environmental information. New cost recovery and commercialisation activities are being developed to provide a return on investment for information collection, intellectual property and know-how.

Access to specialised personnel and computing systems tend to remain the most difficult areas to progress, both in terms of obtaining sufficient suitable resources and ensuring the most cost-effective solutions are in place. In systems acquisition, it is necessary to ensure that appropriate recognition is given to the external influences upon the Branch. This places a high degree of emphasis on matching systems requirements to those specialist areas of international activity which inevitably lie outside departmental systems guidelines. There continues to remain a considerable gap in the capability of industry to provide the computing systems suited to maritime geographic and environmental information without significant design input from within the Branch.

HYDROGRAPHIC DEVELOPMENT

This element is responsible for raising new policy and equipment proposals relating to hydrographic surveying activities. As a result of the Force Structure Review and Inspector General's Report several new initiatives have commenced. These specifically relate to commercial support for hydrographic and oceanographic tasks, relocation of the Hydrographic Office and examination of the uniformed personnel structure. Equipment activity includes:

GPS Receivers - This project is in an advanced state, and delivery of all equipment should be complete by early 1992. The equipment includes; six GPS receivers with laptop computers, printers and associated stores.

Tide Gauge / Current Meter Project - is well underway with equipment soon to be despatched to all hydrographic units, including the LADS Project. The success of the project will see tidal data transmitted to units on request via a telemetry link.

Differential GPS (DGPS) - This project is in the early stages at present, however, procurement of the prime equipment is expected to take place in mid 1992. The equipment will include a ship mounted aerial and receiver/control computer; a portable DGPS monitor station complete with power supply; and necessary stores. The receivers will be interfaced to HYDLAPS. MORESBY, FLINDERS and the Survey Motor Launches will each carry at least one portable DGPS station.

Sidescan Sonar Replacement - This project is in its early stages at present, but is expected to be completed prior to the commissioning of the first Oceanographic Hydrographic Ship (OHS). The project will procure high definition towed sidescan sonar equipment for all MSF ships and spare units for use in SMBs as required.

Microwave Survey Navigation System - The requirement for a microwave survey navigation system will depend upon the success of DGPS for hydrographic requirements. Such a requirement can only be identified by operational experience with DGPS in the Marine Science Force. A DGPS system will be hired for HM Ships SHEPPARTON and BENALLA for their forthcoming survey in PNG waters. Operational experience with DGPS during this survey will determine the way ahead on the microwave survey navigation system.

Laser Airborne Depth Sounder (LADS) Project - During 1990/91, considerable effort has been expended by ships of the Hydrographic Service in conducting 'ground truth' surveys in Queensland and South Australia. This data will provide the depth "benchmark" against which LADS will be trialled. The initial trials in South Australia are intended to prove basic system functionality with the aim of replicating the performance demonstrated in the experimental system, WRELADS II. Subsequent trials in Western Australia and Queensland are designed to optimise LADS over a range of different oceanographic conditions.

Manufacture of the major LADS sub-systems is now virtually complete and the airborne computing and laser systems will be progressively installed in the aircraft from mid 1991. Initial flight trials are programmed to commence in South Australia in August 1991. These trials will include the setting-to-work of the ground computing system for the analysis of data in the field. The trailer mounted vans which house the ground computing and maintenance facility are complete and located at the project site in Adelaide.

LADS is currently expected to enter Naval Service in late 1992. The majority of its early operational surveys are planned for the North Queensland area, including Torres Strait.



LADS F27 AIRCRAFT

BRANCH DEVELOPMENT - PLANNING, POLICY, PROJECTS

This program has supported the implementation of policy, as directed through the Branch Executive and provides long term planning support for information management and cartographic services, including the impact of Program Management and Budgeting on the Hydrographic service.

The primary objective of this program element is to support Branch Development initiatives in line with programmed directives.

The year has been a difficult one as the impact of zero resource growth has been particularly felt within this area.

Australia's direct involvement in the work of the International Hydrographic Organisation's development of standards for the international electronic chart has continued. The Branch commenced planning for an Australian Electronic Chart Test Project which, in conjunction with the Australian Maritime Safety Agency, Australian National Maritime Association and users, is planned to commence late 1991, early 1992, subject to resource availability. The area selected for trials is Torres Strait which, being tropical and unique in many significant ways, will provide valuable lessons which complement those learned in overseas trials. Planning is in hand to produce the Electronic Chart Data Base Test Bed for the region.

Implementation of the Hydrographic Information System (HIS) continues. Delivery of workstations and terminals was effected during the year in line with the planned second phase of acquisition, the Hydrographic Operations Information System (HOPI). Data base implementation has proceeded with 'high volume' testing commencing late June. Management and archiving of digital information remains a key activity of this programme, underwriting future directions and products. The build up of staff numbers and skills is a matter of high priority.

The Hydrographic Office has recently initiated a proposal for an electronic chart trial in the Torres Strait. This will provide experience in producing an electronic navigational chart, practical experience for Australian mariners, and provide valuable information to the international community on the operation of ECDIS in a tropical environment. To date only preliminary investigations have been undertaken.

NATIONAL AND INTERNATIONAL AFFAIRS

National Affairs

The Hydrographer participated in the activities of the following national bodies during the year:

- Association of Australian Port and Marine Authorities
- Inter-Governmental Advisory Committee on Surveying and Mapping
- The Australian Defence Force GIS Consultative Group
- Maritime Service Advisory Committee - Navigation Safety
- Permanent Committee on Tides and Mean Sea Level
- Steering Committee for the National Tides Facility
- The Co-ordinating Committee for Commonwealth Marine Science Agencies

International Affairs

Throughout the year the RAN Hydrographic Office continued active participation in the activities of the International Hydrographic Organisation (IHO) and the International Oceanographic Committee (IOC).

Australia is a member of the IHO Committee on ECDIS (COE) and the Committee for the Exchange of Digital Data (CEDD). Within the COE, Mr K.G. Burrows (Director, Co-ordination &

Development) chairs the Working Group on Data Quality. Following the responses received from various IHO Member States on this subject during the year, a Discussion Paper was prepared for review by the working group. It is anticipated that this would be finalised at the next COE Meeting in December 1991, and the Report submitted for the XIVth IHO Conference to be held in Monaco in May 1991. Mr Burrows was represented by Mr R.A. Furness at the last COE/CEDD Meeting held at Rockville, U.S.A., 19-21 December 1991.

As co-ordinator for the IHO charting initiative for Area Lima (South-East Indian and South-West Pacific Oceans, including Southern Ocean), Australia finalised the third draft for the 1.5 million scale INT (International) series of charts for the area and forwarded it to the relevant nations in June 1991. It proposes a chart scheme comprising 36 charts with an allowance for the addition of extra charts (up to 11) within the overall scheme if required at a later date. The charts have been re-numbered within the IHO guidelines. It is proposed to present the scheme at the 1991 IHO Conference, and to recommend the formation of the South West Pacific Hydrographic Commission, comprising representatives from national hydrographic organisations within the region who would meet at regular intervals to discuss mutual hydrographic and chart production problems, plan joint survey operations, and resolve schemes for International Chart coverage of the region. Regional Hydrographic Commissions already exist for East Asia and the SE Pacific.

The Hydrographer represented Australia's hydrographic interests at the XIX Five Nations Mapping, Charting & Geodesy Director's Conference held during 10-12 October 1990 at Bendigo, Victoria. During the year he also visited the national hydrographic organisations of Canada, France, New Zealand, Norway, United States of America, United Kingdom and the IHO (Monaco) to discuss matters of mutual concern, familiarisation of the current state of the electronic chart, IHO matters, etc.

In July 1990 the then Hydrographer, Commodore J.S. Compton, accompanied by Commander P.J. Mead (Director, Oceanography & Meteorology), visited the United States of America, United Kingdom and France and held discussions on hydrographic/oceanographic matters with the national Hydrographers there. On their return journey opportunity was taken to visit and discuss similar issues with the Hydrographers of India and Indonesia. Useful discussions on oceanographic and meteorological aspects were also held during Commander Mead's visit to the Royal New Zealand Navy Hydrographic Office and other oceanographic organisations in New Zealand in March 1991.

Mr B. Pillich (Tidal Officer) attended the Second Session of the IOC Group of Experts on Global Sea Level Observing System (GLOSS) at Miami, Florida, USA and visited the NOAA Headquarters in October 1991. He also participated actively in the deliberations of the IHO Working Group on Standards for Release of Tidal Data to Commercial Organisations during the year.

Mr B. Searle (Head, Science & Oceanography) attended the first meeting of the Joint IOC/WMO Steering Committee of the Global Temperature/Salinity Pilot Project (GTSP) in Brest, France during September, 1990. Mr G. Hopwood (Head, Computer Services) also attended as a technical observer. At the meeting the GTSP Implementation Plan, which had been written by Mr Searle, was finalised. Aspects of real-time data flow and quality control were discussed and may of the ideas will be incorporated into the AODC's oceanographic data management computer system, Hydrocomp.

Mr Searle and Mr Hopwood also attended the first workshop on Oceanographic Data Archeology sponsored by the USA World Climate Research Program. This workshop was held in Washington DC in September and was attended by data managers, oceanographers and meteorologists from a number of countries including the US, Australia and Japan. A framework to acquire historical oceanographic data was developed.

COMPUTING SERVICES

This element provides specialised computer support for the design, development and maintenance of ADP systems for the Hydrographic Service. Until the acquisition of equipment under the HOPI Project progress on HIS implementation was restricted. However in the next 12 months considerable in house development is planned for HIS and HYDROCOMP, providing a challenge to the computer services section.

All data logged by the decommissioned COOK has been transferred from tape to optical disk. This enables data to be retrieved at a quicker rate and eliminates the need to exercise the tapes. The next step will be to convert the oceanographic data into a format suitable for input to HYDROCOMP.

Integrated Global Services System (IGOSS)

Enhancements have been made to the Specialised Oceanographic Centre (SOC) quality control software to enable statistics to be produced on the number of observations reaching the office. The software is currently being incorporated to the new SUN workstations.

Library Database Management System

A library database management system has been developed. It is currently being used to manage the Hydrographic Office's library, including the AODC's library and Registry to manage files and correspondence. In the future, the program will manage AUTOCHART'S chart archive .

Hydrographic Information System (HIS)

HIS project definition and development is continuing and system implementation has been severely hampered by a lack of funds to enable upgrade of functional software onto a current and more powerful hardware platform. This problem was addressed during this financial year by Project HOPI (Hydrographic Operations Integration) which released \$1.2 million for the purchase of workstations, personal computers and associated peripherals to support the geographic information system requirements of the Branch. Current market Geographic Information Systems (GIS) are only now just reaching a level of maturity and robust functionality and this factor has had a considerable impact on the development process of HIS.

A more structured systems analysis and design philosophy has been adopted for database and project development and several projects continue to evolve. Work in progress on the HIS includes: analysis of a Chart Index Records Database; feasibility study on the requirements for a Survey Area Index Database; database loading of sounding sets obtained from the HYDLAPS system and from other organisations; assessment of scanned manuscript fairsheet data to digital format; development of working papers into HIS survey datums, transformation and projection parameters; and evaluation of quality assessment for survey data. Investigations conducted for development identification and analysis are identifying problems with current information management practices within the organisation and the effects of implementing information systems are being addressed throughout the organisation.

The next twelve months should see the operational implementation of several databases in the Branch. Digital survey data continues to be rendered to the Branch and HIS is developing the mechanisms to effectively manage this data. The introduction of LADS will have a significant impact on HIS in terms of data storage and processing. The unique nature of hydrographic survey information places considerable strain on a GIS technology that is not adequately developed to meet hydrographic information management requirements. HIS continues to demand that the Branch maintain an awareness of the computing technology of the future.

CORPORATE SERVICES

Considerable workload has been undertaken throughout the year, particularly the refinement of Program Management and Budgeting (PMB). Major activity has occurred in the following areas:

Accommodation

A second floor at 118 Walker St was leased in July 91 to accommodate staffing requirements following the rationalisation of activities under PM&B and increased emphasis on the oceanographic function and Branch development. Long term planning for a single facility to house all shore-based Maritime Geographic and Environmental Support facilities continued throughout the year with facilities planning and accommodation design milestones being achieved. A full time project officer was allocated by the Defence Facilities Division.

Program Management & Budgeting

Efforts in Programme Management have been devoted to smooth transfer of responsibility and funds to the component from several different sources. This has been a complex exercise and has resulted in a significant net reduction in budget. Provision of appropriate financial management information has required attention. Revised human resource management arrangements are still evolving.

Full budget information is not available for FY 90/91 because of the process of transition to Program Management and Budgets. However a summary of revenue and expenditure is set out below:

<u>REVENUE:</u>	\$m
Defence Department appropriation	\$23.620
Chart sales revenue	<u>\$1.070</u>
	<u><u>\$24.690</u></u>
<u>EXPENDITURE:</u>	
Salaries - Uniform	\$13.500
Civilian	\$3.280
Administrative expenses (note 1)	\$1.920
Equipment (note 2)	\$0.500
Facilities (note 3)	\$0.580
Ships operations (note 4)	<u>\$4.910</u>
TOTAL EXPENDITURE	<u><u>\$24.690</u></u>

Note 1. Costs of running Hydrographic Office in North Sydney sub-components 215030, 215040 and 215050.

Note 2. Includes hire of survey equipment and repairs.

Note 3. Lease of 1200 sqm at 118 Walker Street, North Sydney.

Note 4. Includes repair and refit costs which are not actually funded by this component. Does not include capital costs.

Staffing

The Branch human resource plan has been progressed throughout the year, in line with the introduction of PMB and deficiencies in structure arising from consolidation of resources after the 1988 Establishment Review and directions endorsed by higher authorities. The draft plan is now being reviewed for publishing next year. As mentioned elsewhere, staff positions are being transferred from Canberra to improve staff resources in Sydney.

Commercialisation

Efforts to improve commercial returns during the year have been limited by lack of resources. Efforts have been focussed on providing these resources with limited success. Work has progressed on licence arrangements for the reproduction of charts in electronic media by commercial manufacturers

Programme Evaluation

During the year a Programme Evaluation was conducted by the Inspector General's Division of the Department of Defence. A wide ranging report was published January 1991. The following chapter headings give an indication of the scope of the report;

- Introduction of the Issues
- Technology and Organisation in Transition
- Strategic and Defence Requirements
- National Responsibilities
- Cost Recovery
- Programme Management Implications

There are a number of useful Annexes and Diagrams. Copies of the report are available from the Inspector General Division, Department of Defence, Po Box E33, Queen Victoria Terrace, Canberra, ACT. Ph (06) 266 8234.

DEVELOPMENT AND COORDINATION - Sub-Component 215050

Assessment Against Major Performance Indicators

The major performance indicator for this sub-component in the year under report are:

- a. A review of the uniformed manpower plan for the Marine Science Force. This has commenced a review of the present and future requirements of the organisation.
- b. Evaluation of Commercial Support to supplement the Hydrographic tasks, ashore and afloat.
- c. Coordination of international information exchange. Sponsorship and participation with the Electronic Chart Display and Information System (ECDIS) and IHO committees has been actively pursued.
- d. Development of HIS to efficiently manage the hydrographic database. Project HOPI (Hydrographic Operations Integration), which released \$1.2 million for the purchase of workstations, personal computers and associated peripherals, will support the information system requirements of the Branch.

APPENDIX 1 **SURVEYS UNDERTAKEN JULY 1990-JUNE 1991**

Ship/Unit	Commanding Officer	Areas
HMAS MORESBY	CMDR L.J. GEE RAN	HI 154B Defence Survey Cape Naturaliste HI 157 Cape Wessel to Cape Stewart - Fig. 2 HI 165 Approaches to Melville Island - Fig. 4
HMAS FLINDERS	LCDR J.W. PATERSON RAN LCDR P.A. SPENCER RAN (from 28 Dec 90)	HI 133 Woodlark Island West - Fig.7 HI 159 Nuakata Island - Fig.6 HI 163 Gulf of Papua - Fig.5
HMAS MERMAID	LCDR P.A. SPENCER RAN LCDR R.W. QUARRILL RAN (from 21 Dec 90)	HI 157 Cape Wessel to Cape Stewart - Fig.2 HI 158 Supp1 Archer Point to Cape Kimberley - Fig. 3 HI 165 Approaches to Melville Island - Fig.4
HMAS PALUMA	LCDR M.J. SINCLAIR RAN LCDR J.W. MASCHKE RAN (from 2 Nov 90)	Surveys in company withMERMAID
HMAS SHEPPARTON	LCDR A.R. DENNISON RAN	HI 157 Cape Wessel to Cape Stewart - Fig. 2 HI 143 Gulf of St Vincent & Spencer Gulf LADS Support Survey
HMAS BENALLA	LEUT D.B. ERRINGTON RAN	Surveys in company with SHEPPARTON
HODSU	LEUT K.D. SLADE RAN	HI 131 Hanns Inlet HI 161 Approaches to Casey - Fig 1 HI 166 Hunter River Tomago Canal

APPENDIX 2

SURVEY EQUIPMENT IN SERVICE

Hydrographic Equipment

Echo Sounders	:	Krupp Atlas Deso 20 ELAC 4721 Raytheon DE 719 AN/UQN 4
Sonars	:	Simrad Searchlight Sonar Skipper S113 Searchlight Sonar EG & G DCS3 Side Scan Sonar 259 Mk 3&4 ELAC LAZ 72 Side Scan Sonar
Electronic Positioning	:	Cubic Western ARGO DM 54 Motorola Miniranger MRS 3 Motorola Falcon IV Magnavox 1105 Magnavox 1102
Tidal	:	Bristol Elliott Tide Gauges ONO Current Meters Wesdata Tide Gauges
Boats	:	10m aluminum Survey Motor Boats (MORESBY-3, FLINDERS-1, School-1, HODSU-1) 10m timber Survey Motor Boat (School-1)
Data Logging and Processing	:	HYDLAPS Qubit Trac V /Chart V/ChartV(M) Qubit Trac IV/Chart IV

Land Survey Equipment

Principal Land Surveying Equipment includes:

Theodolites	:	Wild T2
Levels	:	Wild/Nikon/Fuji Automatic levels
EDM	:	Tellurometer MRA 7 Sokkisha Red 2L
Geociever	:	Magnavox 1502

APPENDIX 3

CHART PRODUCTION AND MAINTENANCE

	1987/88	1988/89	1989/9	1990/91
New Chart Production				
New Charts Published	11	17	12	7
New Editions Published	12	8	5	4
New Charts/Diagrams for RAN use	23	18	15	12
Miscellaneous Chart	1	1	1	7
Chart Maintenance				
Modified Facsimiles of BA chart	0	2	0	0
Notice to Mariners block corrections	41	36	39	38
Revisions by reprinting	180	197	154	175
Revisions by screen printing	36	140	160	123
Miscellaneous Graphics	77	64	27	56
Screen Printing overlays prepared	36	140	160	123
Negatives processed for printing	0	0	0	502
Chart Printing				
New charts	11	17	12	7
New Editions	12	8	5	4
Revised charts	180	197	154	175
Reprinted charts	165	153	96	103
Bathymetric charts	0	0	33	25
Facsimile reproductions	0	1	0	0
Modified reproductions	0	2	0	0
Charts for Fleet purposes	4	4	2	12
Miscellaneous charts	0	19	1	7

Chart printing by RA Survey Regiment Bendigo, Victoria; - 303 charts, 130 747 copies.

APPENDIX 4

CHART SCHEME STATISTICS 30 JUNE 1991

CATEGORY/SCALE	PUBLISHED IMPERIAL	PUBLISHED METRIC	TOTAL PUBLISHED	TOTAL PLANNED
1:150 000 Aus, PNG	29	55	84	199
1:300 000 Aus, PNG	33	28	61	101
1:1 000 000 Aus, PNG, Antarctica	6	3	9	34
1:500 000 and smaller Aus, PNG, Antarctica	2	1	3	13
Large scale 1:5 000 to 1:100 000				
Aus	20	93	113	202
PNG	27	2	29	40
Antarctica	1	2	3	4
Territories & Reefs	2	3	5	16
International Charts				
1:1 500 000	0	1	1	20
1:3 500 000	0	6	6	6
1:10 000 000	0	1	1	1
Recreational Charts PC	2	5	7	12
Y (Yachting) Series	1	3	4	4
RAN Fleet Series	19	13	32	40
Diagrams	17	4	21	40
TOTALS	159	220	379	732

APPENDIX 5

DESCRIPTION OF NEW CHARTS PUBLISHED

NEW CHARTS

Aus 119 - Approaches to Esperance, 1:75 000
(published 14 Sep 90)

Originally published in 1974, same number. Chart geographical area has been amended to include surveyed shoals south of the original chart limits. Vertical datum has been adjusted from ISLW to Port Datum. The plan of Esperance harbour was reschemed from a scale of 1:12 500 (original Aus 119) to 1:15 000, providing a better plan of approach to the Port of Esperance. A plan of Bandy Creek Boat Harbour, 1:7 500 scale has been included. Hydrographic surveys by the Department of Marine and Harbours 1988 and RAN to 1986 have been incorporated. Production was accomplished by digital processing.

Aus 316 - Charles Point to Pelican Islet, 1:300 000
(published 19 Oct 90)

A coastal navigation chart which completes the Timor Sea/Joseph Bonaparte Gulf area in digital metric format. Included are RAN surveys 1983-87 and digital data from larger scale charts Aus 724, Aus 725, Aus 726 published in 1989.

Aus 388 - Karkar Island to Kairiru Island, 1:300 000
(published 22 Nov 90)

This coastal navigation chart of the north coast of Papua New Guinea is the first covering this particular geographical area. For many years there has been a gap in published charts at this scale, between chart Aus 389 and British Admiralty chart 2240. Coastal navigation was previously accomplished using an unsatisfactory chart scale of 1:750 000. Metric digital chart Aus 388 includes coastal surveys between Wewak and Karkar Island, conducted by the RAN.

Aus 607 - Cocos (Keeling) Islands, 1:25 000
(published 31 May 91)

This digital metric chart was published to replace British Admiralty chart 2510, 1:37 500, published in imperial units in 1962. The waters surrounding these islands, the passages through Port Refuge and the inner islands basin, were surveyed by the RAN in 1983.

Aus 606 - Approaches to Cocos (Keeling) Islands, 1:150 000
(published 31 May 91)

An ocean approach chart to replace plan on British Admiralty chart 2510, 1:250 000 scale published 1962. This digital edition includes deep ocean surveys approaching North and South Keeling Islands conducted by RAN, in 1973 and 1983.

Aus 63 - Mary Anne Passage, 1:50 000
(published 31 May 91)

A large scale chart indicating the recommended route through Mary Anne Passage from surveys by the RAN in 1988.

Aus 762 - Investigator Island to Cape Le Grand, 1:150 000
(published 28 Jun 91)

A coastal navigation chart, the first at this scale, providing comprehensive detail of the waters adjoining this area of the Western Australia south coast and to seaward to the continental shelf. The majority of hydrographic surveys throughout the chart area were conducted by the RAN in 1981, 1983, 1986 and 1989.

NEW EDITIONS OF CHARTS

AUS 602 - Approaches to Davis Anchorage, 1:12 500
(printed NE 14 Sep 90)

Published in 1989, Aus 602 was revised to include a RAN survey of 1990 south of Gardner Island. Details from this source depict the southern approach to Australia's Antarctic base, Davis. The original chart limits have been extended southward to include the full extent of the RAN survey.

Aus 839 - Cairncross Islets to Arden Island, 1:150 000
(printed NE 8 Mar 91)

General revision and inclusion of RAN hydrographic surveys of 1979, 1981, 1989. Vertical datum has been adjusted from ISLW to Lowest Astronomical Tide (LAT).

Aus 5020 A & B - Australian Index of Nautical Charts and Publications
(printed NE Jan 1991)

Both of these index charts are updated annually to include limits of new published charts, adjust information relative to new editions and charts withdrawn, amend lists of nautical publications and diagrams, and include details of chart agents throughout Australia.

APPENDIX 6

CHARTS IN PRODUCTION (at 30 JUNE 1991)

NC - New Chart; NE - New Edition

CHART NO	CATEGORY	TITLE	SCALE	STATE/ LOCALITY
Aus 732	NC	Buccaneer Archipelago to Collier Bay	1:150 000	WA
Aus 733	NC	Buccaneer Archipelago to King Sound	1:150 000	WA
Aus 323	NC	Adele I to Lacepede I inc King Sound	1:300 000	WA
Aus 835	NE	Cape Weymouth to Cairncross Island	1:150 000	Q
Aus 112	NE	Approaches to Fremantle	1:37 500	WA
Aus 763	NC	Cape Le Grand to Cape Pasley	1:150 000	WA
Aus 235	NE	Approaches to Moreton Bay	1:75 000	Q
Aus 249	NE	Hay Point to Penrith Island	1:75 000	Q
Aus 200	NE	Port Jackson	1:20 000	NSW
Aus 236	NE	Moreton Bay	1:75 000	Q
Aus 384	NC	Cape Vogel to Cape Nelson	1:300 000	PNG
Aus 742	NC	Rosemary Island to Barrow Island	1:150 000	WA
Aus 743	NC	Barrow Island to Onslow	1:150 000	WA
Aus 523	NC	Nassau Bay to Finsch Harbour	1:150 000	PNG
Aus 654	Modified Reproduction	Plans in New Guinea (BA chart 2054)	various	PNG
Aus 61	NC	Montebello Islands	1:25 000	WA
Aus 21	NC	Snake Bay	1:37 500	NT
Aus 721	NC	Port Essington to Snake Bay	1:150 000	NT
Aus 4621	NC	Mackay to Port Moresby	1:1 500 000	AUS/PNG
Aus 450	NC	Cape Rouse to Sandefjord Bay	1:500 000	ANTARCTICA
Aus 451	NC	Sandefjord Bay to Cape Rundingen	1:500 000	ANTARCTICA
Aus 547	NE	Lolobau Island to Willaumez Pen	1:150 000	PNG
Aus 156	NC	Western Port Entrance North Arm	1:37 500	VIC
Aus 152	NC	Plans in Western Port	various	VIC
Aus 502	NC	Cape Blackwood to Bramble Cay	1:150 000	PNG

Aus 840	NE	Arden Island to Bramble Cay	1:150 000	Q
Aus 700	NE	Western Approaches to Torres Strait	1:150 000	Q
Aus 163	NE	Port of Burnie	1:25 000	TAS
Aus 601	NC	Approaches to Casey	1:50 000	ANTARCTICA

APPENDIX 7

HYDROGRAPHIC INFORMATION RECEIVED DURING THE YEAR

Hydrographic Information Received from RAN Sources

HMAS FLINDERS	HI 163	Cape Blackwood to Orokolo Bay
HMAS MORESBY	HI 152 HI 154 HI 155	CARNAC 240 LADS Trial area Sub safe bottoming area (SW Coast) Sound range, King George Sound
HMAS MERMAID	HI 112	SQUAT Trial Snapper Island
HMAS PALUMA	HI 149(2)	Bee Reef to Endeavour Reef
HMAS PALUMA/MERMAID	HI 157 HI 158Supp	Cape Wessel to Cape Stewart Archer Point to Cape Kimberley Vigia Investigation Arafura Sea
HMAS SHEPPARTON	HI 131	Hanns Inlet
HMAS SHEPPARTON/ BENALLA	HI 160	North Queensland LADS Trial area
HODSU	HI 131 HI 166	Hanns Inlet Hunter River Tomago Canal
HYDROGRAPHIC OFFICE		Darling Harbour Cockle Bay
HMAS COOK		GLORIA Survey Albany

From Non-Service Sources

NSW

Maritime Services Board	Port Jackson, Sydney Cove, Campbell Cove, Farm Cove
RN Hydrographic Office, Taunton	Kiama to North Head, Lord Howe Island
Public Works Dept	Coffs Harbour
Telecom	Broken Bay-submarine cables crossing

QLD

AIMS (AUSLIG)	Great Barrier Reef, Bowling Green Bay, Flinders Reef, Rip Cay
BHP Engineering	South Trees Island
Cairns Port Authority	Cairns
Dept Harbours & Marine	Geraldton, Mooloolaba, Pumicestone Passage, Gladstone, Hay Point
DOT-Marine & Port Division	Gold Coast, Rosslyn Bay, Bellara, Koopa Channel, Manly Boat Harbour, Mission Point, Hay Point, Wide Bay, Moreton Bay, Pallarenda Beach, Karumba, Thursday Island, Daintree River, Bloomfield River, Weipa, Townsville, Gladstone, Bundaberg, Port Douglas, Cooktown, Burdekin River, Torres Strait, Tin Can Bay, Bowen, Mooloolah River, Clinton, Wide Bay Bar, Leeper Reef, Point Victor
MV Star Jasmine	Booby Island
GBRMPA	Great Barrier Reef

Gladstone Port Authority

Mapping & Hydro Survey

Port of Brisbane Authority

Cardno & Davis Aust P/L

JB Goodwin & Associates

Telecom Australia

RN Hydrographic Office, Taunton
North Reef-Pine Peak, Percy Island,

Gladstone

Redland Bay

Lytton Rocks

Kawana Waters

Kawana Estates

Daydream I Mount Rooper

Sandy Cape, Whitsunday Passage,
Keppel Isles, Palm Isles

NT

Darwin Port Authority

RN Hydrographic Office, Taunton

RAAF

MV Star Jasmine

SA

BHP Engineering

Dept Marine & Harbours

Darwin

Booby Island to Cape Wessel

Bathurst Island (photo)

Cape Arnhem, Cape Wessel

Marricks Reef

Port Adelaide

TAS

Dept of Main Roads

Marine Board of Devonport

Marine Board of Hobart

Port of Devonport Authority

Currie Harbour

Devonport Port Entrance

Oyster Cove

Ulverstone

VIC

AUSLIG

Port of Melbourne Authority

Flinders Naval Base

Westernport, Portland, Port Phillip,
Corner Inlet, Mallacoota Inlet

WA

AUSLIG

Dept of Harbours & Marine

Fremantle Port Authority

WA Petroleum P/L

Dept of Land Administration

Australian Construction Services

Cockburn Sound

Peel Inlet, Harvey Estuary,
Cambridge Gulf, Shark Bay,
Bremer Bay, Bandy Creek

Rous Head

King Bay

Rosemary Island, Barrow Island,
Onslow, Esperance, Yampi Sound,
Mary Anne Passage

HMAS Stirling, Garden Island

Overseas

Solomon Islands

Indonesia

Papua New Guinea

Fiji

San Cristobal-Malaita I

Sungai Aika, Selat Muli,
Unji Point

Lombrum, Madang, Kutubu,
Lae, Iagifu, Nakari

North Fiji Basin Ridge

Antarctic

AUSLIG

Australian Construction Services

RN Hydrographic Office, Taunton

Larsemann Hills, Windmill Island,
Australian Antarctic Territory

Mawson, Casey, Davis

Pravda Coast

Boating Charts

Dept of Harbours & Marine

Busselton, Mandurah, Two Rocks,
Rottnest Island, Cervantes,
Green Island, Peaceful Bay,
Wilson Inlet, Yanchep,
Guilderton, Lancelin, Jurien,
Swan & Canning Rivers,
Ocean Reef to Cape Peron,
Port Broughton, Lower Murray

Topographic Maps

AUSLIG
Central Mapping Authority
Dept of Lands WA
RASC
SUNMAP

14
2
27
156
2

Bathymetric Maps

Hydrographic Office Canberra

Killiecrankie, Barker,
Venus Bay, Jurabi Point,
Cape Van Diemen, Edel,
Robinson River, Blue Mud
Bay, Mornington, SD54-14

Bathymetric Manuscripts

Hydrographic Office Canberra

Cape Arid, Junction Bay,
Malcolm, Du Couedic,
Bathurst Island,
Bougainville Reef, Melville
Island, Goulburn Island,
Holmes Reef, Herald Cays,
Diamond Islets, Southampton,
Reef, Magdelaine Cays,
Ribbon Reef, Cape Melville,
Ashmore East, Maer,
Percy Isles, Lihou Reef,
Truant Island

AUSLIG

Proserpine, Thursday Island

Satellite Imagery

AUSLIG

Cape York, Trobriand Island

ACRES

Cape Jervis, Tagula Island,
York Peninsula, Adelaide

AUSLIG/ACRES

Cape Arid, Cape Adieu,
Twin Head, Wilson Bluff,
Red Rocks Point, Twilight
Cove, Misima, Port Moresby,
Port Lincoln, Cape Direction

APPENDIX 8

CHART DISTRIBUTION

DISTRIBUTION OF CHARTS AND ASSOCIATED PUBLICATIONS

		<u>86/87</u>	<u>87/88</u>	<u>88/89</u>	<u>89/90</u>	<u>90/91</u>
Australian	issued	27 123	29 166	32 208	28 743	20 961
	sold	124 680	116 360	118 526	101 928	100 429
British	issued	14 658	14 527	17 234	17 421	17 493
	sold	6 035	9 779	6 204	6 456	6 260
New Zealand	issued	918	1 458	1 514	1 252	1 564
	sold	264	720	208	340	295
Canadian	issued	30	16	44	158	61
	sold	70	68	69	45	68
TOTAL		173 788	172 094	176 007	156 343	147 133

VALUE OF CHARTS AND ASSOCIATED PUBLICATIONS SOLD

(exclusive of sales tax)

	<u>86/87</u>	<u>87/88</u>	<u>88/89</u>	<u>89/90</u>	<u>90/91</u>
Australian	\$706 589	\$706 030	\$889 188	\$861 029	\$853 773
British	\$104 301	\$104 328	\$96 484	\$103 482	\$136 295
New Zealand	\$1 846	\$3 131	\$2 575	\$3 975	\$3 424
Canadian	\$455	\$442	\$455	\$297	\$449
TOTAL	\$813 191	\$813 931	\$988 702	\$968 783	\$993 941

REVENUE SUMMARY:

Net Sales as per Sales Summary.....	\$ 993 941
Plus Sales Tax.....	\$ 66 659
Plus Freight & Sundries.....	\$ 9 831
TOTAL REVENUE	\$1 070 431
Value of Stock Issued	\$ 530 037

RETAIL CHART PRICES (includes sales tax)

	<u>86/87</u>	<u>87/88</u>	<u>88/89</u>	<u>89/90</u>	<u>90/91</u>
Australian	\$10.60	\$11.10	\$14.38	\$14.38	\$14.38
British	\$22.47	\$27.82	\$23.09	\$28.93	\$28.93
New Zealand	\$12.23	\$13.81	\$13.81	\$13.81	\$12.84
Canadian	\$7.26	\$7.26	\$7.26	\$7.26	\$7.26

APPENDIX 9

STAFFING LEVELS

Uniformed

Hydrographic Survey Specialists

The numbers of PNF hydrographic specialists in the Hydrographic Service on 30 June 1991 were as follows (1990 figures in brackets):

Rank	Billets	Manning
Commodore	1	1 (1)
Captain	1	1 (1)
Commander	3	5 (4)
Lieutenant Commander	11	11 (11)
Lieutenant	23	19 (19)
Sub Lieutenant	0	1 (2)
WOSR	1	1 (1)
CPOSR	5	6 (5)
POSR	12	9 (11)
LSSR	26	18 (21)
ABSR/SMNSR	71	47 (41)
Totals	154	119 (117)

Meteorological and Oceanographic Specialists

The numbers of Meteorological and Oceanographic (METOC) specialists on 30 June 1991 were as follows (1990 figures in brackets):

Rank	Billets	Manning
Commander	2	6 (6)
Lieutenant Commander	6	7 (7)
Lieutenant	7	5 (3)
Sub Lieutenant	0	1 (0)
WOM	1	1 (1)
CPOM	1	3 (3)
POM	4	5 (5)
LSM	15	17 (15)
ABM	24	21 (21)
SMNM	0	5 (5)
Totals	60	71 (66)

Civilian

The following civilian personnel were employed in the Hydrographic Service on 30 June 1991:

	Establishment	Average Staffing Level	Manning 30 Jun 91
Hydrographic Survey	3		3
Oceanographic Survey	-		-
Navigation Services	99		78
Environmental Services	8		7
Development & Corporate Services	36		26
Totals	146	110	114

APPENDIX 10

HYDROGRAPHIC SERVICE ORGANISATION KEY

PERSONNEL

STD: 02

Hydrographer	Commodore J.W. Leech RAN	925 4251
Personal Assistant	Mrs H. Mullins	925 4221
Operations		
Director Hydrographic Operations	Captain R.J. Willis RAN	925 4801
Head Operations and Surveying	Commander D.C. Holliday RAN	925 4804
Staff Officers Operations	Lieutenant N.S. Lemon RAN Lieutenant R.G. Shepherdson RAN	925 4807
Quality Control Officer	Lieutenant Commander G.R. Cann RN	925 4808
OIC Detached Survey Unit	Lieutenant K.D. Slade RAN	925 4283
Tidal Officer	Mr B. Pillich	925 4872
Survey Equipment Officer	Chief Petty Officer G.L. Stuart	925 4812
Head Navigation Services	Mr M.A. Bolger	925 4850
Sailing Directions Officer	Captain J. J. Doyle RANEM	925 4851
Head Nautical Charting	Mr B.C. Leonard	925 4870
Supervisor Chart Editing	Mr M. Griffin	925 4874
Supervisor Cartographic Support	Mr R. Walker	925 4854
Supervisor Chart Production	Mr W. Wagstaff	925 4832
Manager Information Services	Mr I. Kennedy	925 4853
Manager Chart Distribution	Mr N. Gillin	925 4880

Co-ordination and Development**STD: 02**

Director Co-ordination and Development	Mr K.G. Burrows	925 4201
Manager Branch Development	Mr R. Furness	925 4203
Manager Hydrographic Development	Commander G.J. Geraghty RAN	925 4220
Systems Integration Officer	Lieutenant Commander R.E. Ward RAN	925 4231
Head Computer Services	Mr G. Hopwood	925 4260
Manager National and International Affairs	Mr J. Randhawa	925 4209
Manager Corporate Services	Mr K. Reid	925 4205
Manager Administrative Services	Mr J. O'Brien	925 4218

Oceanography and Meteorology

Director Oceanography and Meteorology	Commander D. J. Knight RAN	925 4232
Oceanographic Staff Officer	Vacant	925 4233
Head Science and Oceanography	Mr B. Searle	925 4230

Canberra**STD:06**

Director Operational Facilities	Mr B. Willington	253 2399
Administrative Services Officer	Mr D. Wilcox	253 2399
Hydrographic Projects Officer	Lieutenant Commander D.H. James RAN	253 2567

Nowra**STD:044**

Commander Naval Weather and Oceanographic Centre	Commander C.A. Low RAN	21 1268
--	------------------------	---------

ADDRESSES

SYDNEY

RAN Hydrographic Office
161 Walker Street
NORTH SYDNEY NSW 2060

P.O. Box 1332
NORTH SYDNEY NSW 2059

Switch: (02) 925 4800

Telex: AUSHYD AA 72669

Fax: (02) 925 4835

Signal: HYDRO RAN

CANBERRA

Operations Facilities Section
NCR House
10 Cohen Street
BELCONNEN ACT 2617

Phone: (06) 253 2399

Fax: (06) 253 1612

Hydrographic Projects Officer
PO Box E33
Queen Victoria Terrace
CANBERRA ACT 2600

Phone: (06) 253 2399

Fax: (06) 253 1613

Field Units

Naval Weather and Oceanographic
Centre
Naval Air Station
NOWRA NSW 2540
Phone: (044) 21 1269

HMAS MORESBY
P.O. Box 228
ROCKINGHAM WA 6168
Phone: (09) 527 0470

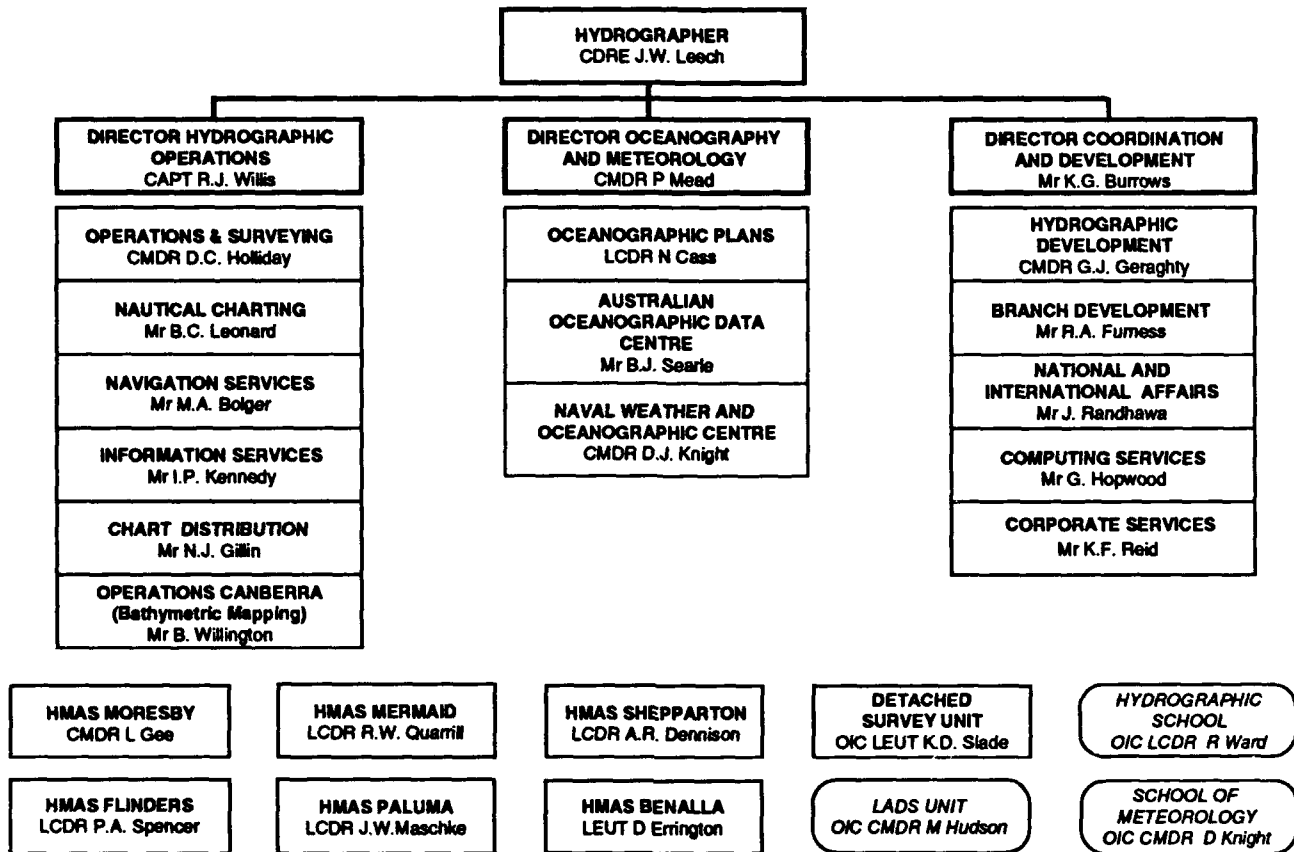
HMA Ships FLINDERS,
MERMAID, PALUMA
SHEPPARTON, BENALLA
c/o HMAS CAIRNS
Draper Street
CAIRNS QLD 4870
Phone: (070) 50 3311

Training Schools

RAN Hydrographic School
HMAS PENGUIN
Naval Post Office
BALMORAL NSW 2091
Phone: (02) 960 0264

RAN School of Meteorology
Naval Air Station
NOWRA NSW 2540
Phone: (044) 21 1512

HYDROGRAPHIC SERVICE RAN



ILLUSTRATIONS

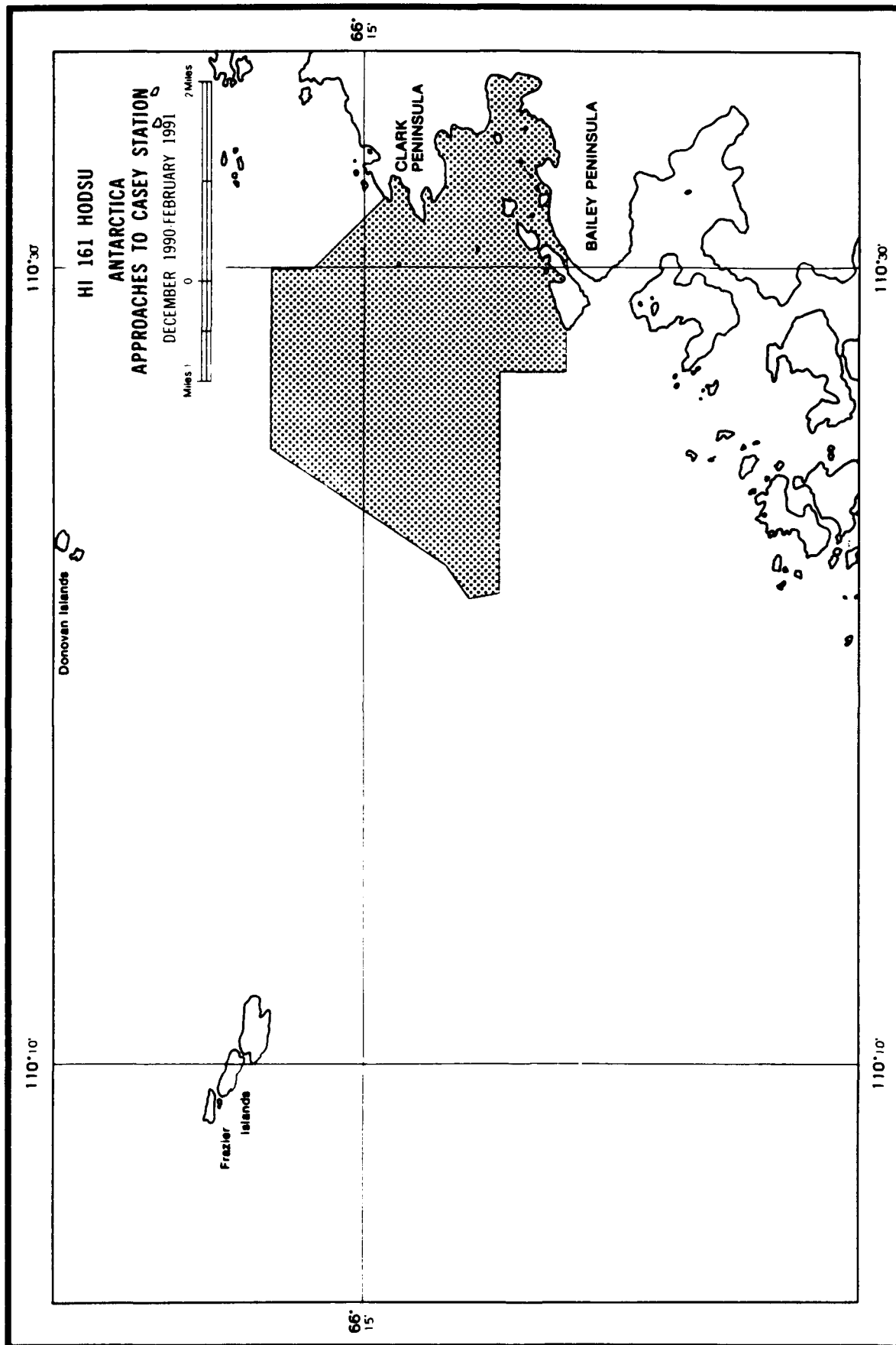


FIG 1

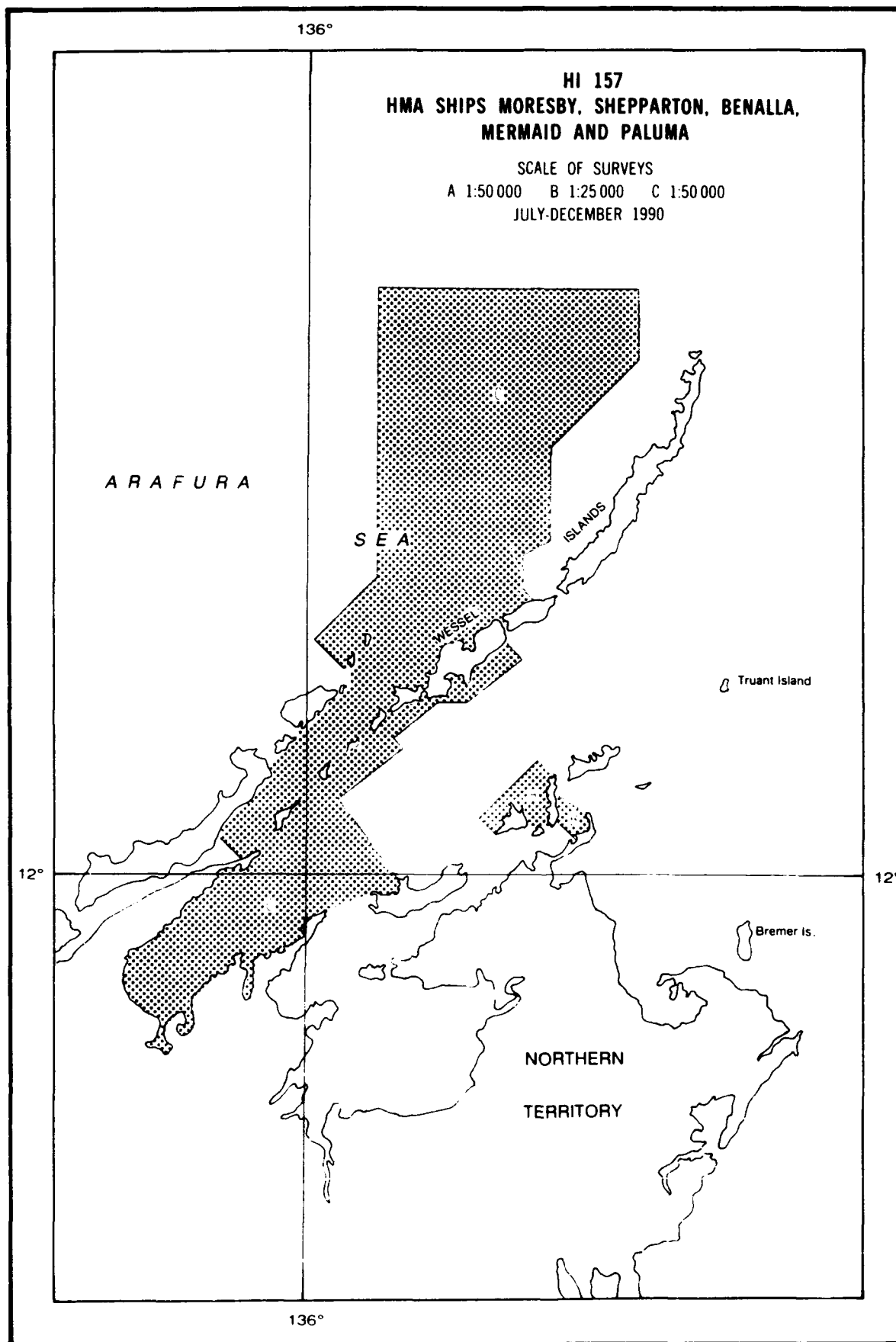


FIG 2

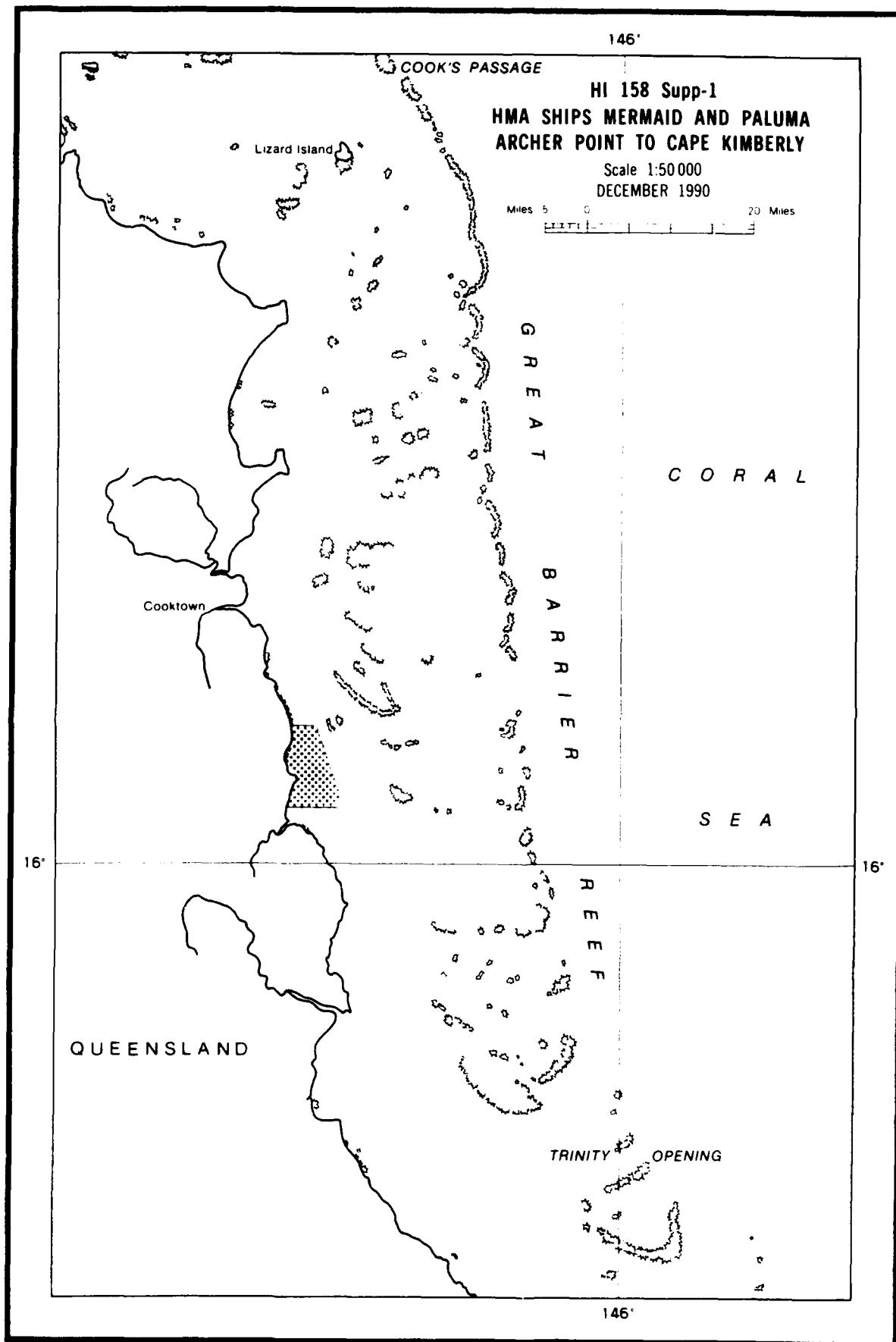


FIG 3

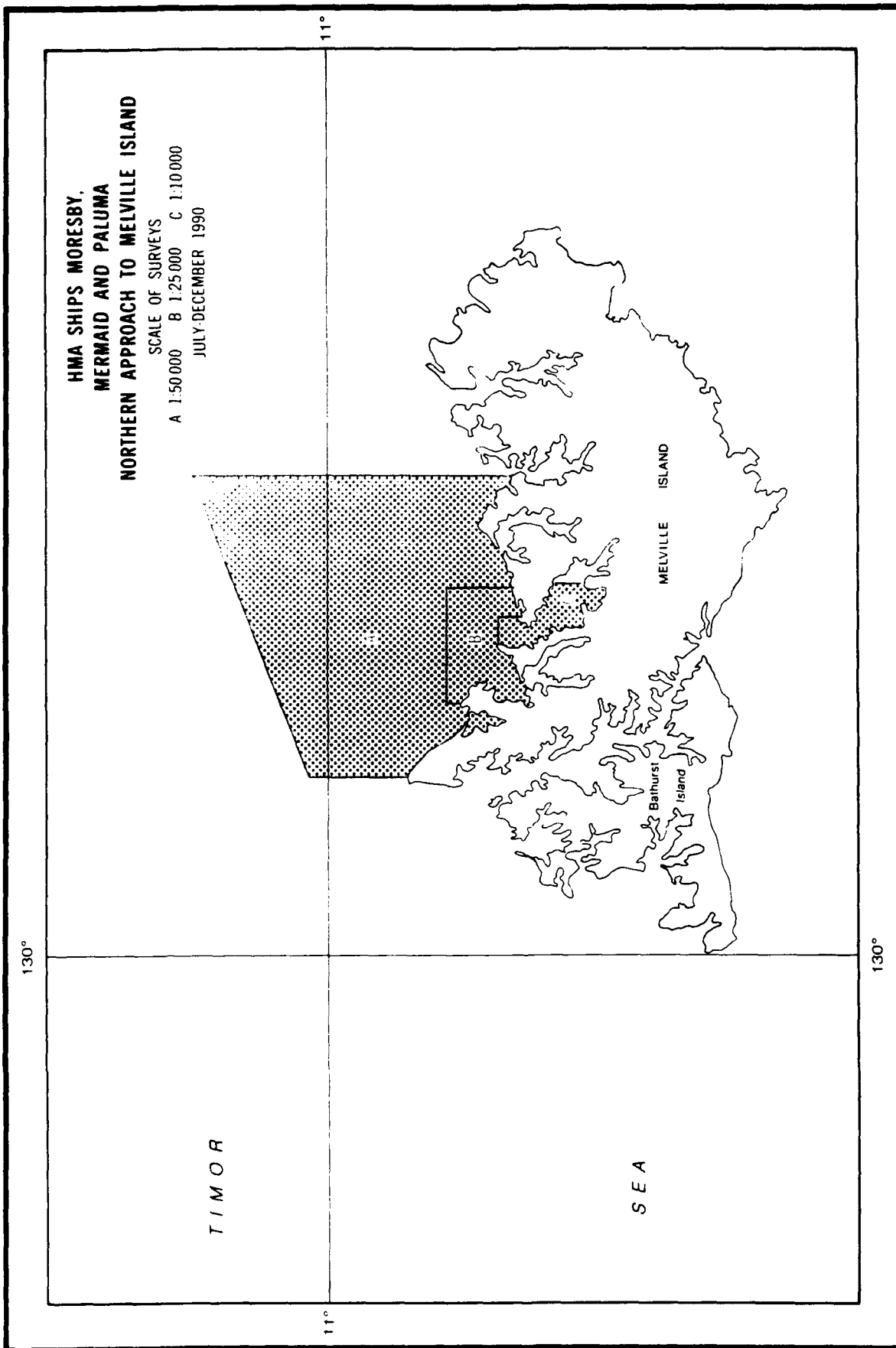


FIG 4

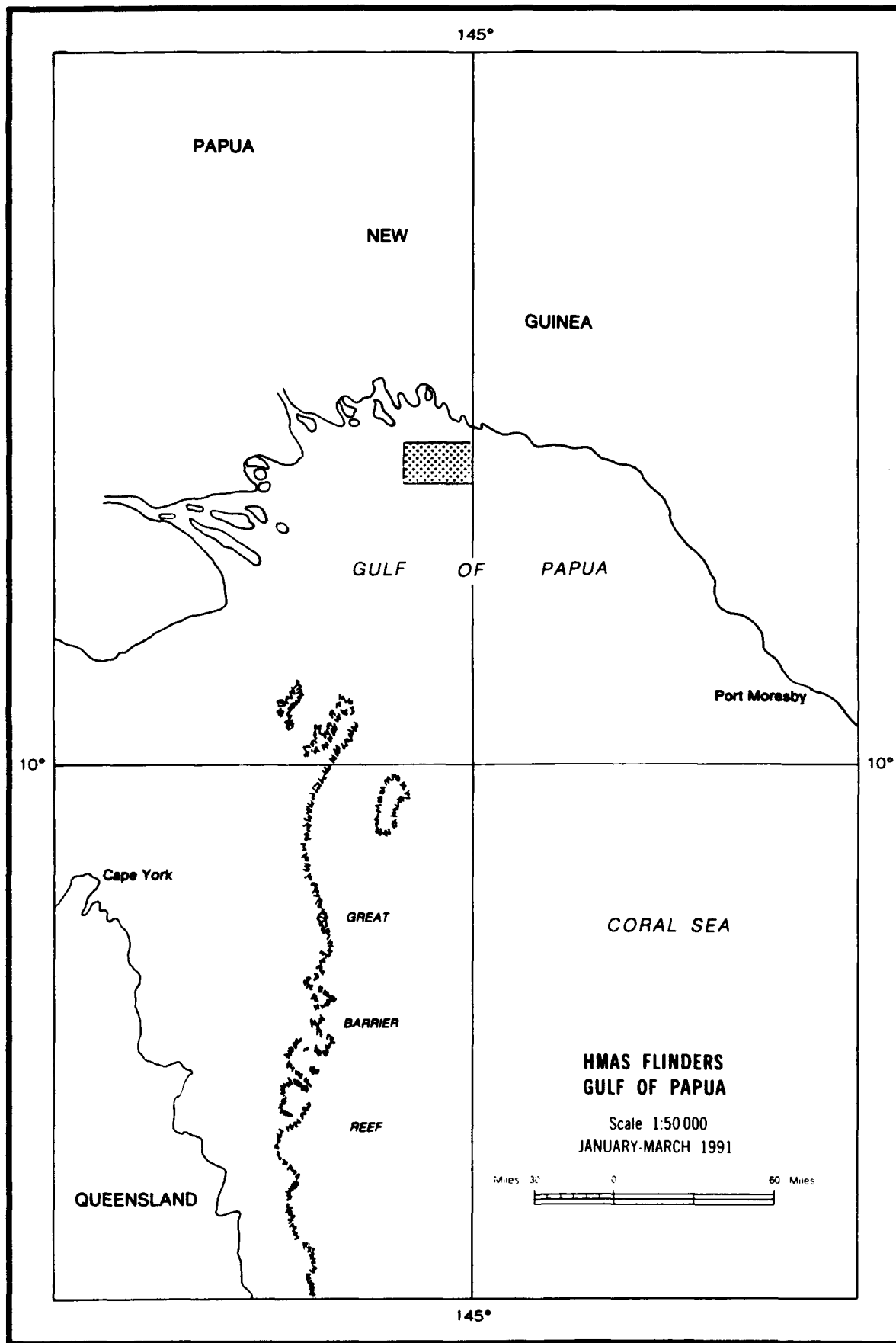


FIG. 5

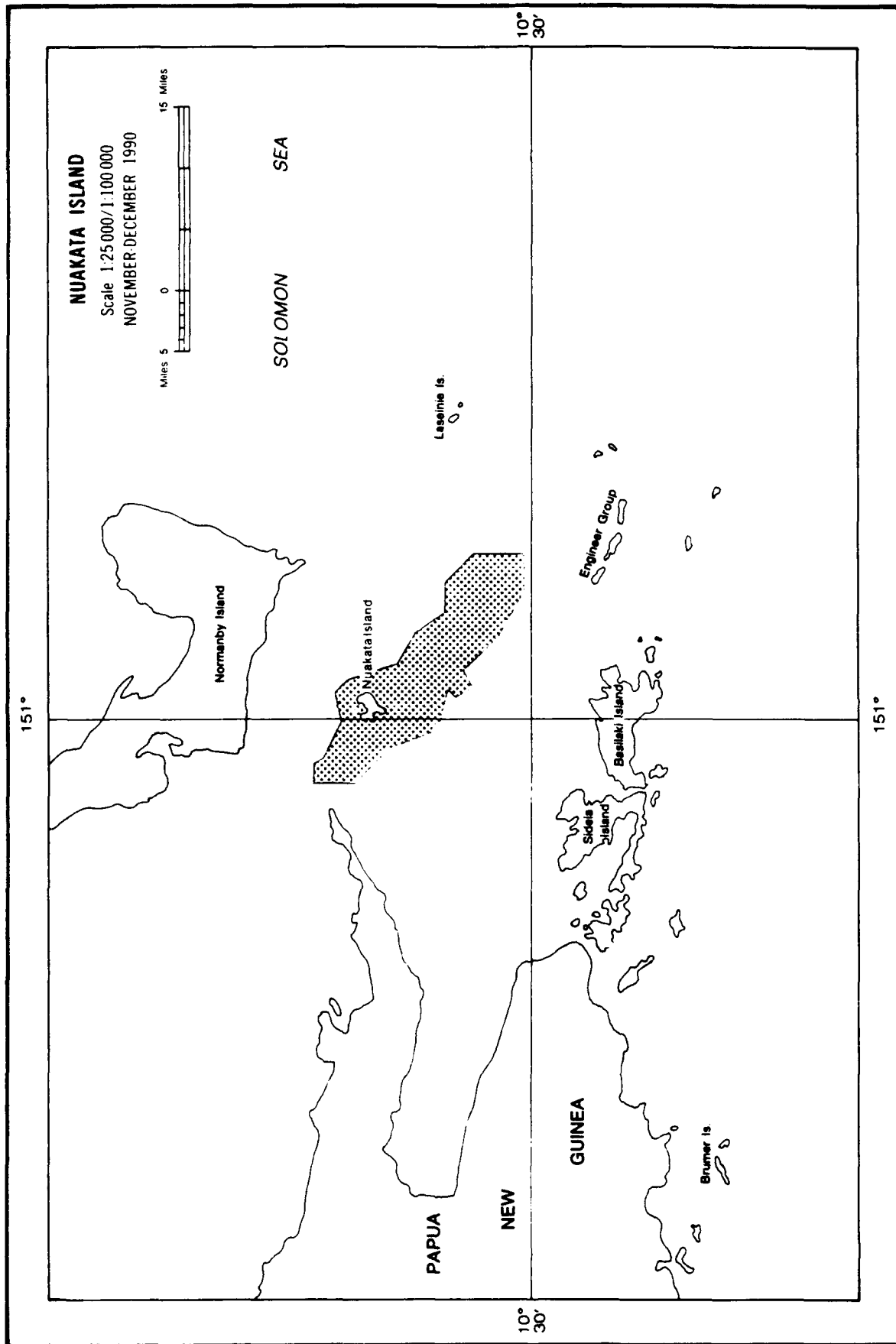


FIG 6

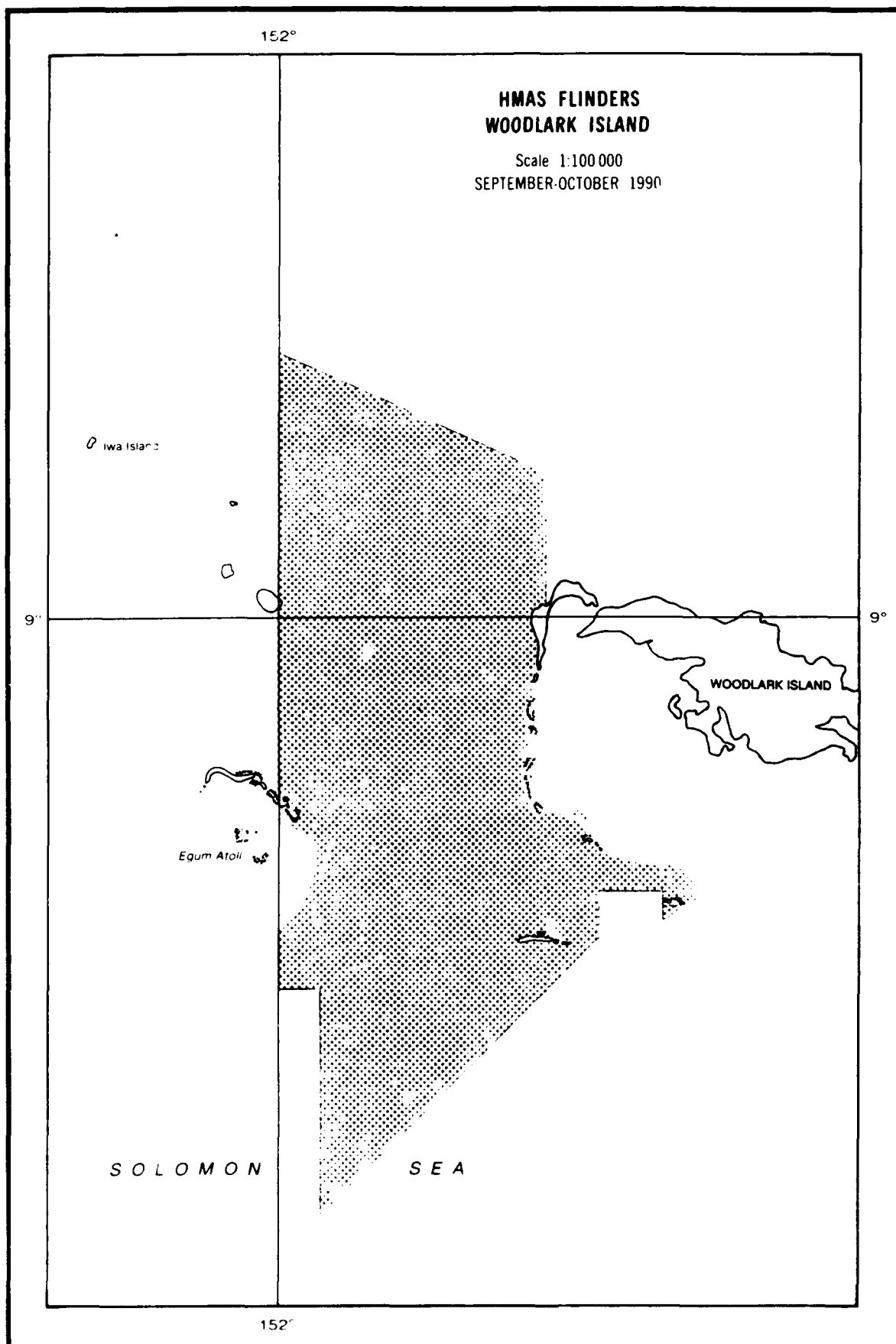


FIG 7



FIG. 8

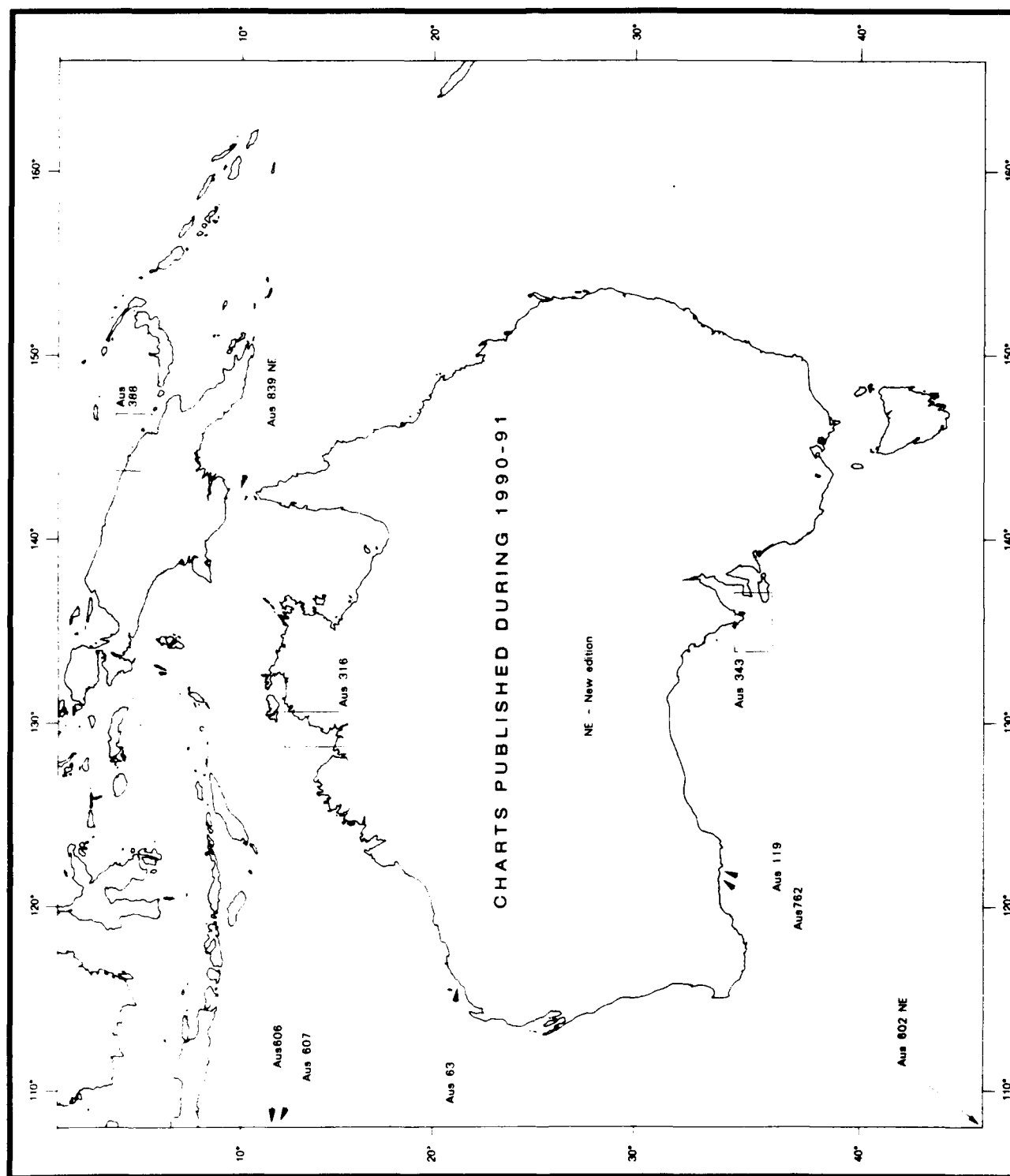


FIG 9

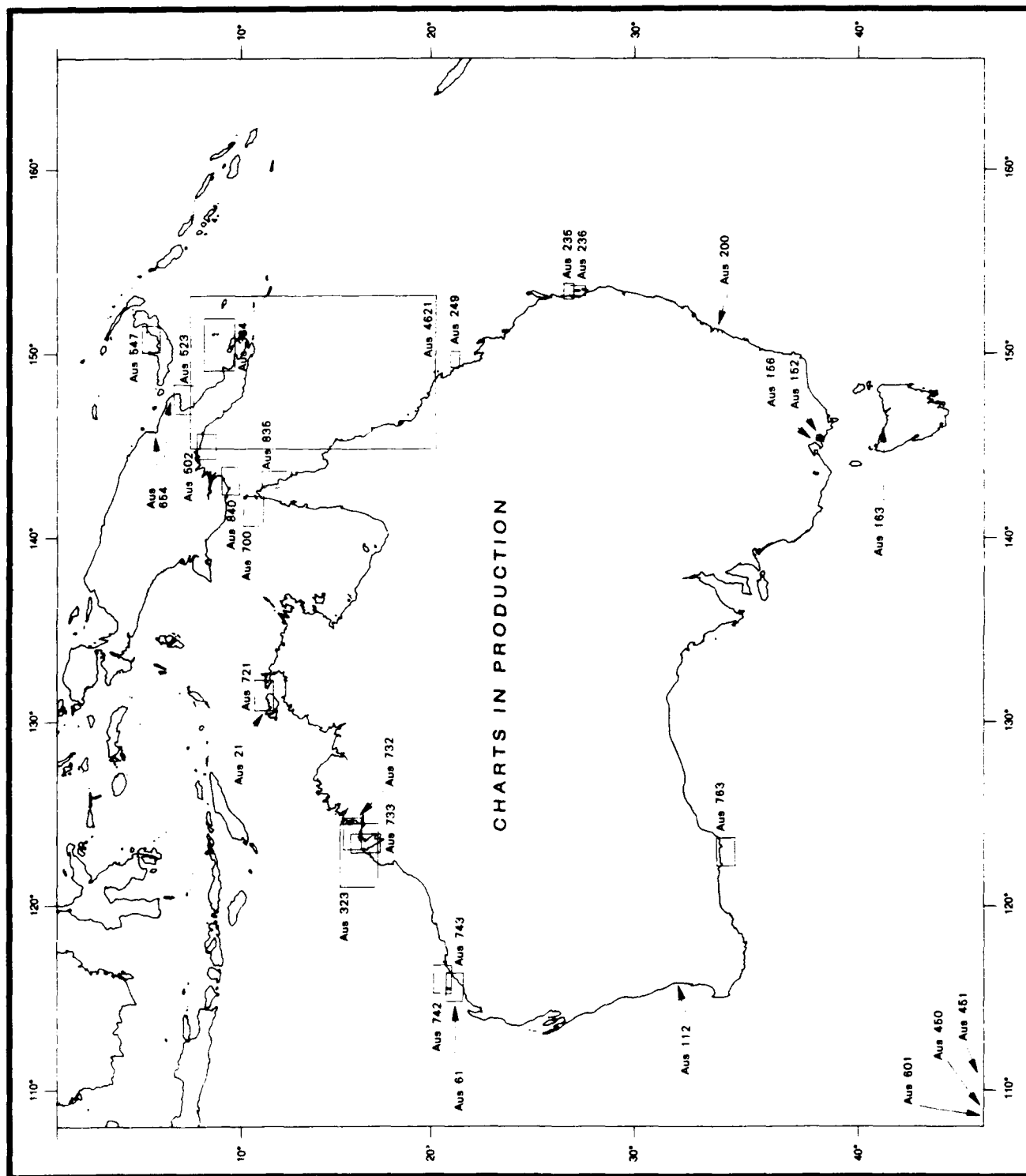


FIG. 10

1:250 000 BATHYMETRIC
MAPPING PROGRAM

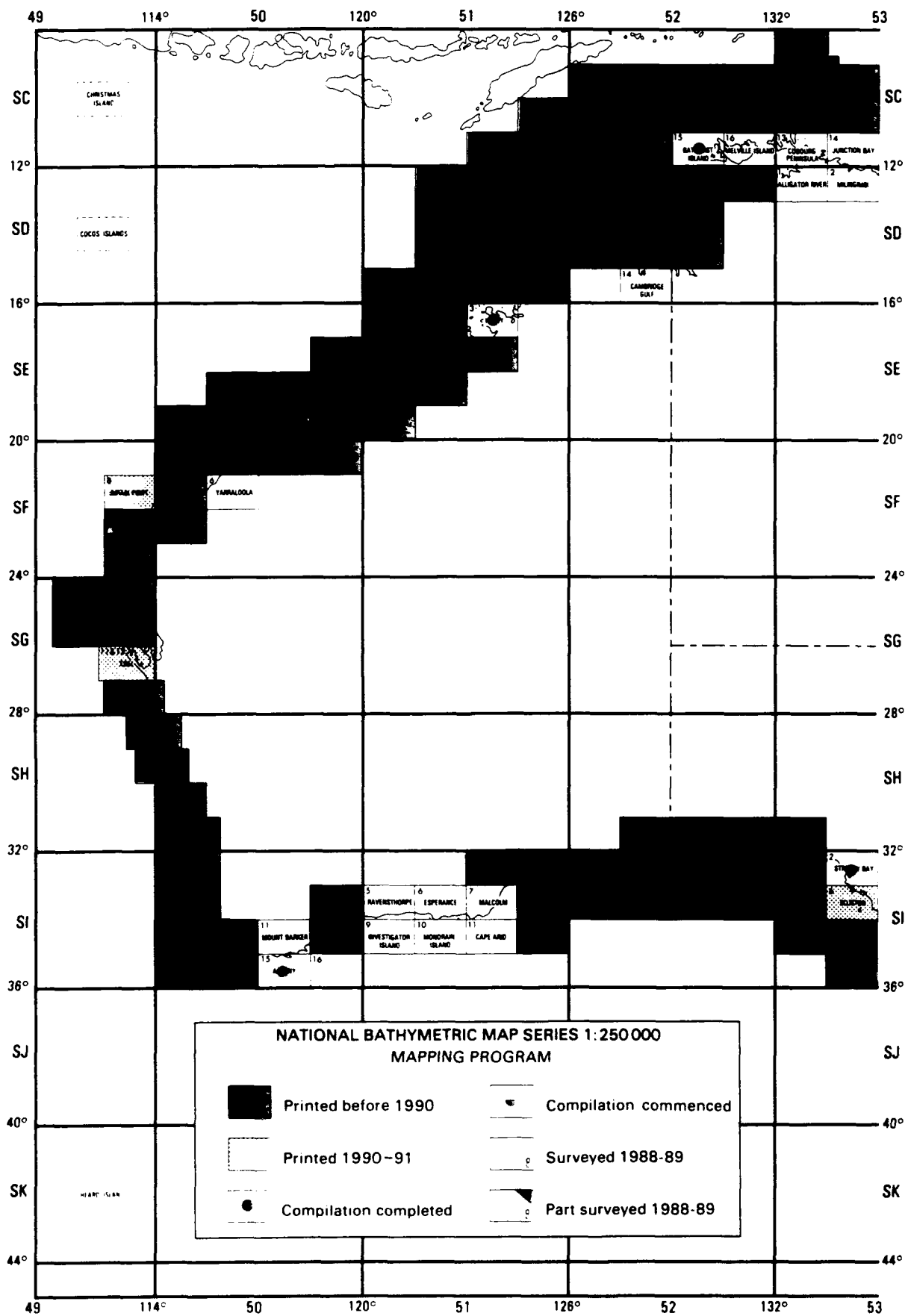


FIG. 11 A

1:250 000 BATHYMETRIC
MAPPING PROGRAM

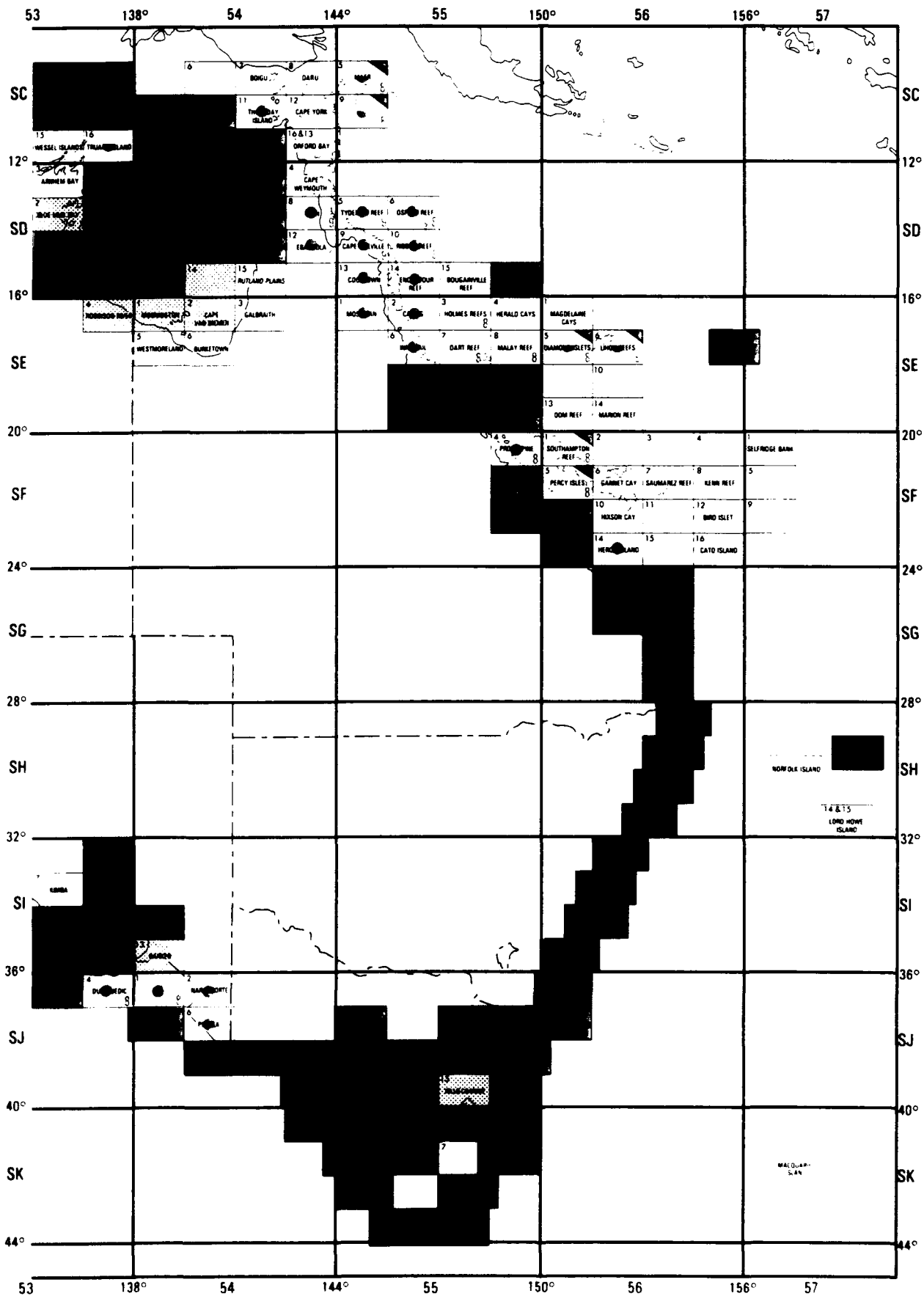


FIG. 11 B

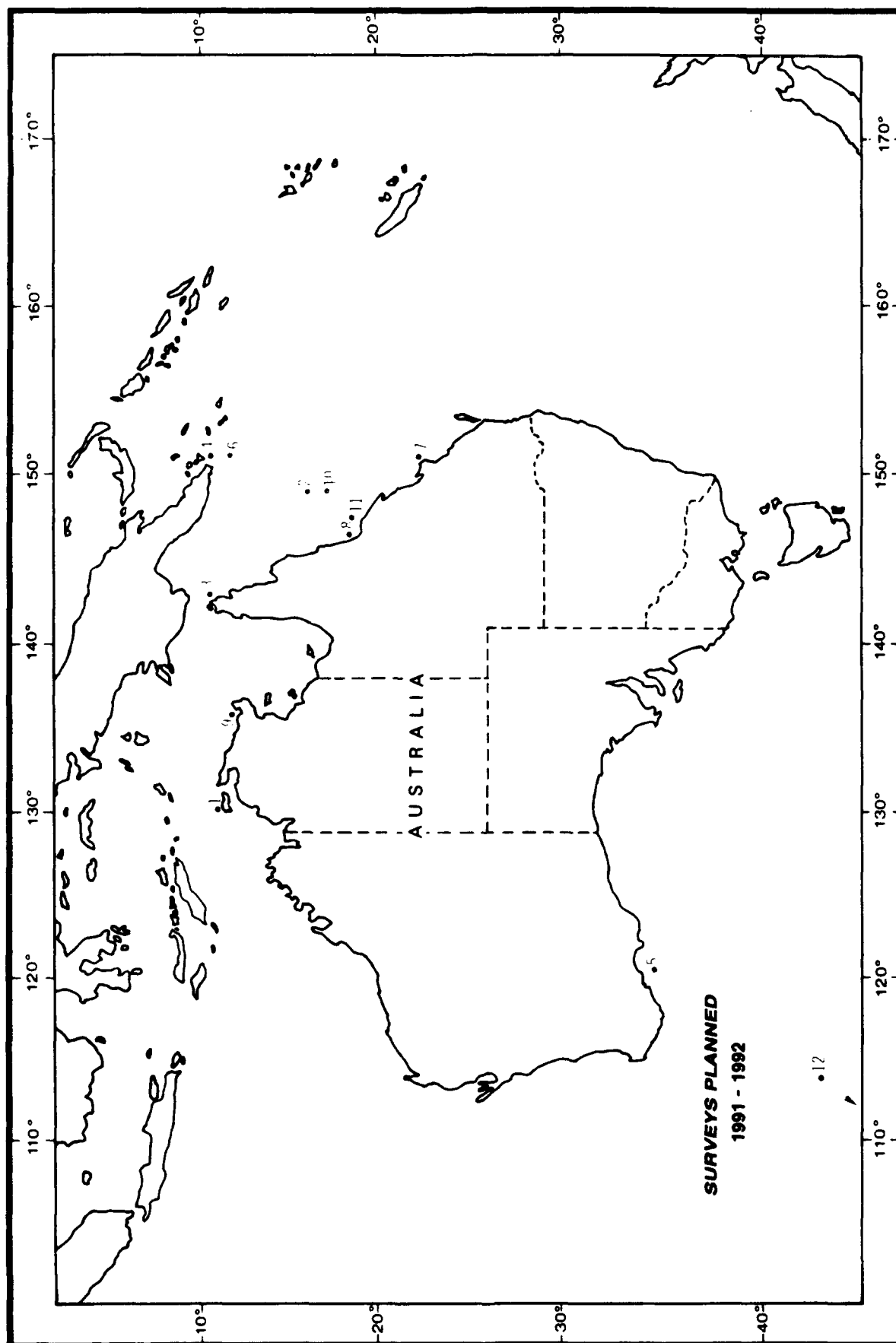


FIG 12

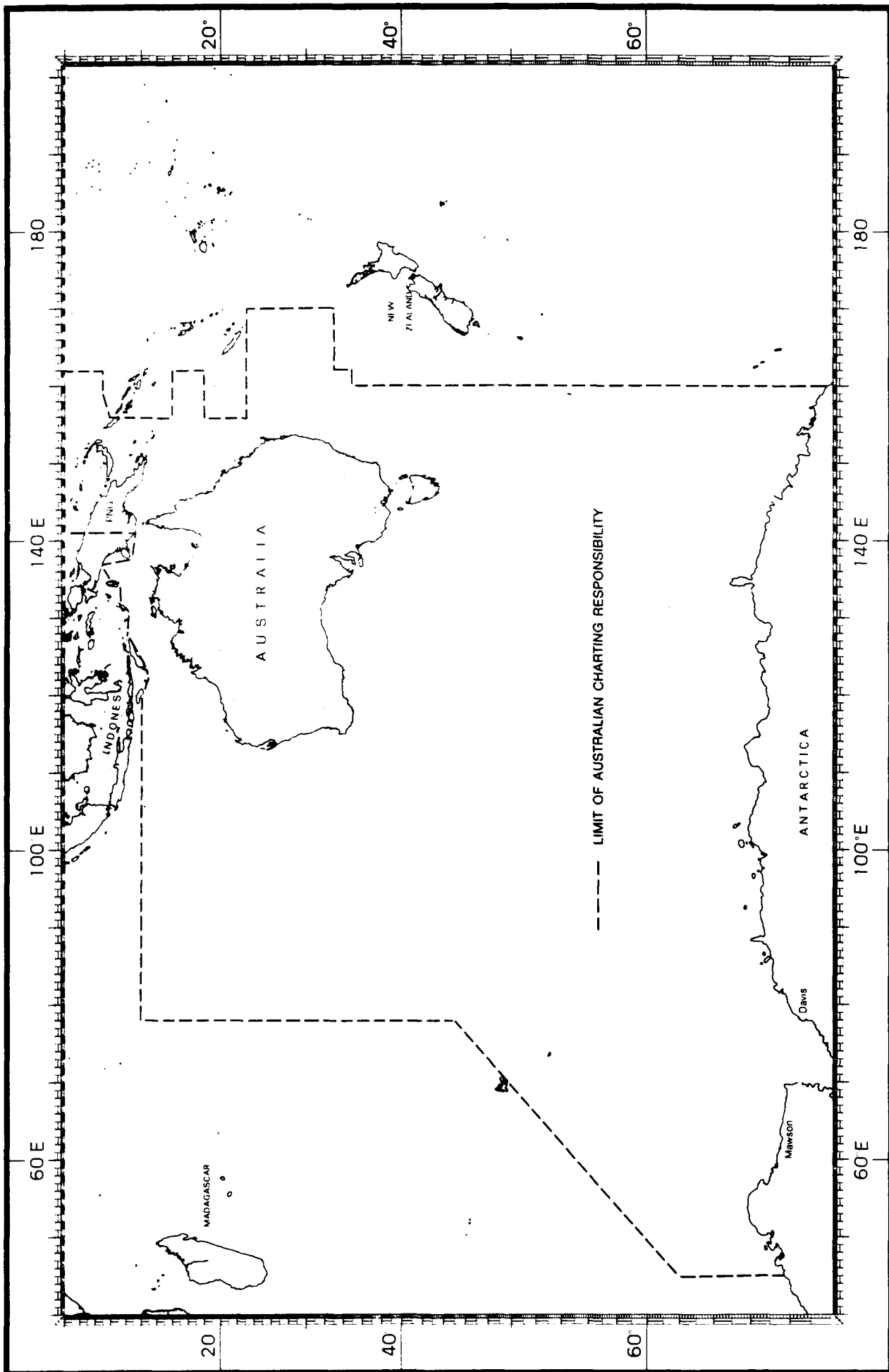


FIG 13

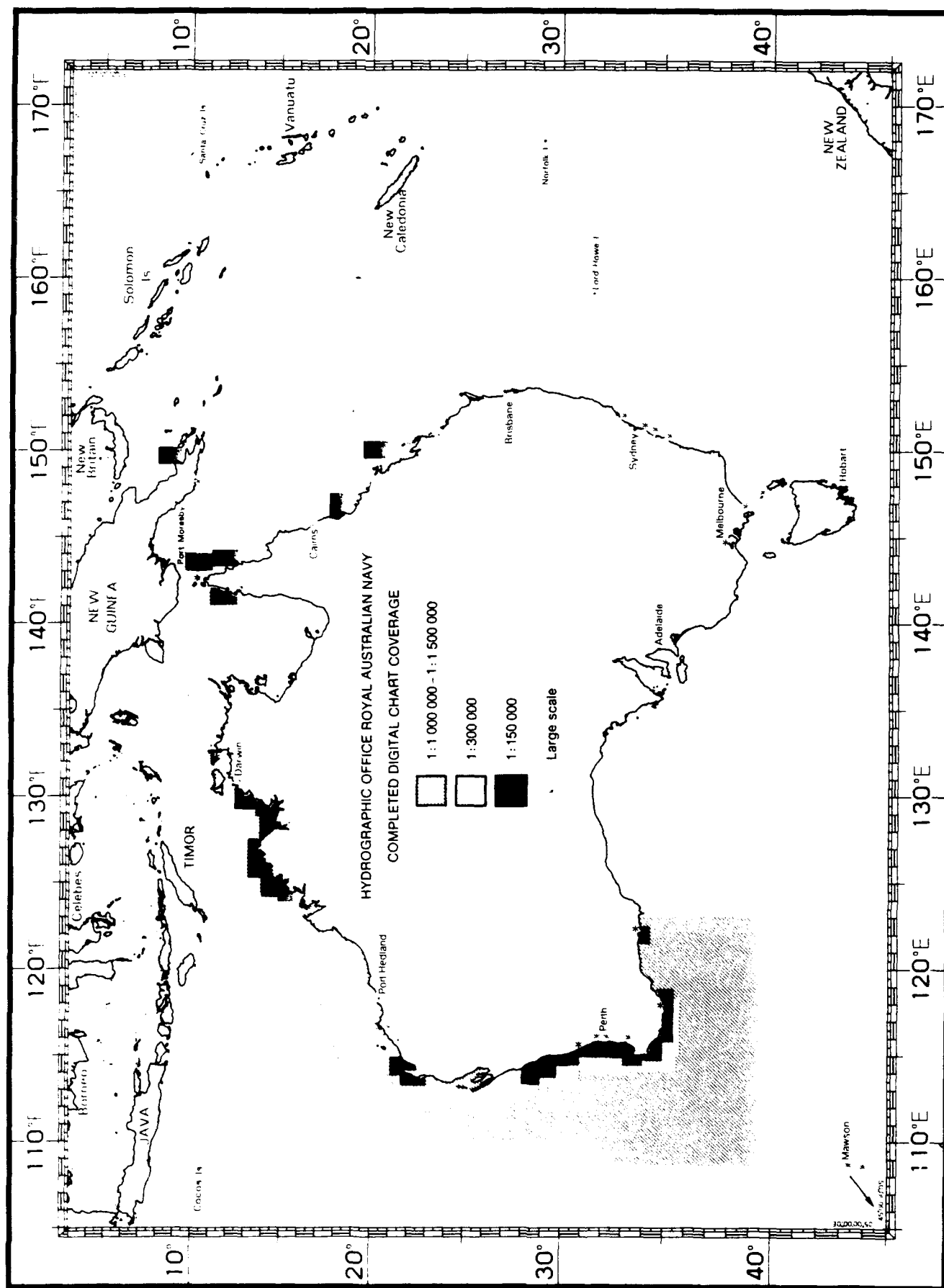


FIG 14

DISTRIBUTION LIST

1. Departmental and Service Authorities

Department of Defence, for attention:

The Minister for Defence
Secretary, Department of Defence
Chief of the Defence Force
Vice Chief of the Defence Force
Deputy Chief of Naval Staff
Assistant Chief of Naval Staff (Materiel)
Assistant Chief of Naval Staff (Personnel)
Director General, Naval Policy and Maritime Doctrine
Director General, Joint Operations and Plans
Director General Force Development (Sea)
Director, Joint Intelligence Organisation
Director of Public Information
Assistant Secretary, Resources Planning - Navy
First Assistant Secretary, Resources, Finance and Policy
Assistant Secretary, Defence Information Services Branch
Hydrographer, RAN (20 copies)

Maritime Commander Australia
Flag Officer Naval Support Command
Naval Officer Commanding, West Australia Area
Naval Officer Commanding, Victoria Area
Naval Officer Commanding, Queensland Area
Naval Officer Commanding, North Australia Area
Naval Officer Commanding, South Australia Area
Naval Officer Commanding, Tasmania Area
Naval Officer-in-Charge, Cairns (2 copies)
Commodore, Naval Air Station, Nowra
Commander Australian Mine Warfare Force
Commanding Officer, HMAS MORESBY
Commanding Officer, HMAS FLINDERS
Commanding Officer, HMAS PALUMA
Commanding Officer, HMAS MERMAID
Commanding Officer, HMAS SHEPPARTON
Commanding Officer, HMAS BENALLA
Officer In Charge LADS Unit
Director of Survey (Army) (5 copies)
Commandant, Australian Defence Force Academy
Joint Services Staff College, Canberra
RAN Staff College, HMAS PENGUIN
RAN College, Jervis Bay
Naval Weather and Oceanographic Centre, HMAS ALBATROSS
Navigation Faculty, HMAS WATSON
Hydrographic School, HMAS PENGUIN (4 copies)
RAN Liaison Officer, Bendigo
RANR Hydrographic Officers (10 copies)
Defence Research Centre, Salisbury
DSTO, Sydney
Director General Maritime Studies Programme

2. Commonwealth and State Organisations

Commonwealth Surveyor General (AUSLIG)
Bureau of Mineral Resources
CSIRO Division of Fisheries and Oceanography
Secretary, Senate Standing Committee for Trade & Commerce
Department of Primary Industry, Fisheries Division
Great Barrier Reef Marine Park Authority, Canberra
Great Barrier Reef Marine Park Authority, Townsville
Department of Foreign Affairs (for AIDAB)
Australian Parks and Wildlife Service
Australian Maritime Safety Authority (4 copies)
Bureau of Meteorology, Melbourne
Surveyor General, New South Wales
Deputy Director-General (Land Information) Department of Property and Services, Victoria
Surveyor General, Queensland
Surveyor General, South Australia
Director, Division of Mapping and Survey, Department of Land Administration, Western Australia
Director of Mapping, Department of Lands Parks and Wildlife, Tasmania
Director, Mapping and Information Division Department of Lands and Housing, Northern Territory
Central Mapping Authority, New South Wales
Department of Public Works, New South Wales
Minister for Shipping and Aviation Support
Director, Australian Antarctic Division
Director, National Resource Information Centre
Director, Environmental Resources Information Network
Director, Bureau of Transport Economics, Canberra

3. Port and Marine Authorities

Chief Executive Officer, Association of Australian Port and Marine Authorities

Queensland

Division of Harbours and Marine, Brisbane
Brisbane Port Authority
Bundaberg Port Authority
Cairns Port Authority
Gladstone Port Authority
Mackay Port Authority
Rockhampton Port Authority
Townsville Port Authority

New South Wales

Maritime Services Board of New South Wales,
Sydney Ports
Hunter Ports
Illawarra Ports

Victoria

Port of Geelong Authority
Port of Melbourne Authority
Port of Portland Authority

Tasmania

Navigation and Survey Authority of Tasmania
Marine Board of Burnie
Marine Board of Circular Head
Marine Board of Flinders
Marine Board of Hobart
Marine Board of King I
Port of Devonport Authority
Port of Launceston Authority

South Australia
Department of Marine and Harbours, Adelaide

Western Australia
Department of Marine and Harbours, Western Australia
Aibany Port Authority
Bunbury Port Authority
Dampier Port Authority
Esperance Port Authority
Fremantle Port Authority
Geraldton Port Authority
Port Hedland Port Authority
Pilbara Harbour Services

Northern Territory
Marine Division , Department of Transport and Works, Darwin
Darwin Port Authority

4. Shipping Organisations and Pilot Associations

Australian National Maritime Association
Secretary, Australian Chamber of Shipping (6 copies)
Secretary, Australian Steamship Owners Federation
Manager, Shipping Operations, ANL
Manager, Shipping Operations, BHP
Manager, Shipping Operations, TNT Bulkships
Manager, Shipping Operations, Howard Smith
Secretary, Queensland Coast and Torres Strait Pilot Service (6 copies)
Secretary, Port Phillip Pilot Association
Brisbane Marine Pilots
Harbours Corporation of QLD

5. Overseas

International Hydrographic Bureau, Monaco
Hydrographer of the Navy, (UK) (4 copies)
Hydrographer, Royal New Zealand Navy
Director General, Canadian Hydrographic Service
Chief Hydrographer, Government of India
Chief Hydrographer, Republic of Indonesia
Hydrographer, Port of Singapore Authority
Director, Hydrographic Department, Malaysia
Director General, Office of Hydrographic Affairs Republic of Korea
Chief Hydrographer, Government of Japan
Director, National Oceanic and Atmospheric Administration, USA
Scientific Adviser, Hydrography, Defense Mapping Agency, USA
Commanding Officer, USN Oceanographic Office
Mission Oceanographique du Pacifique, FMF, Noumea, New Caledonia
Surveyor General, Papua New Guinea
Department of Transport, Division of Marine, PNG (For Hydrographer)
Papua New Guinea Harbours Board
Chief Hydrographer Fiji
Adviser, Hydrographic Unit, Solomon Islands
Adviser, Hydrographic Unit, Vanuatu
The Librarian, PNG University of Technology

6. Research Organisations and Professional Bodies

The Victorian Institute of Marine Science
The Australian Institute of Marine Science, Townsville
The Hydrographic Society, Australasian Branch
The Australian Institute of Cartographers
The Institution of Surveyors, Australia
James Cook University of North Queensland
Ocean Sciences Institute, Sydney University
National Tidal Facility
CSIRO Division of Oceanography, Hobart

7. Tertiary Educational Institutions (Libraries)

New South Wales

Sydney University
University of New South Wales
Macquarie University
University of New England
Newcastle University
Wollongong University
University of Technology, Sydney

Victoria

Melbourne University
Monash University
Latrobe University
Deakin University
Royal Melbourne Institute of Technology

Queensland

Queensland University
The James Cook University of North Queensland
Griffith University

South Australia

University of Adelaide
Flinders University
South Australian Institute of Technology

Western Australia

University of Western Australia
Murdoch University
The Curtin University of Technology

Australian Capital

Australian Defence Force Academy (4 copies)
Australian National University

Tasmania

University of Tasmania
Australian Maritime College, Launceston

8. Libraries

Parliamentary Library, Canberra

National Library, Canberra

OIC Document Exchange Centre, Canberra (19 copies)

Defence Regional Libraries (5 copies)

State Libraries (6 copies)

Librarian, National Maritime Museum, Sydney

Serials Unit, Aquisition Branch, State Library of Queensland, PO Box 488, Sth Bris 4101.

9. Chart Agencies

Australian Chart Agents (93 copies)

10. Internal

48 copies

Total 410 copies