RDA International, Inc.

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TUVALU
BOTTOMFISH PROJECT
BIOLOGICAL ASSESSMENT SUMMARY
YEAR ONE

Pacific Islands Marine Resource Project
Tuvalu Component
Project No. 879-0020

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1.0 EXECUTIVE SUMMARY

Field and classroom programs in Year 1 provided training for twenty local Tuvaluan fishermen in bottomfishing techniques, data collection/entry and analysis procedures. Seventeen research cruises were completed using the Government of Tuvalu vessel, the *R/V Manaui*. Eleven different geographical areas were hydrographically surveyed and systematically fished. Two small seamounts suitable for depletion experiments were located and charted. A total of 7,324 kg of fish of 44 different species were caught during research fishing operations. Of this total, 24 species were marketable, with a total weight of 6,037 kg. Three species, *Etelis carbunculus*, *Etelis coruscans* and *Caranx lugubris* made up the majority of catch by weight. The average CPUE of all species was 6.10 kg/line-hour, and 5.03 kg/line-hour for marketable species, which is good by regional standards. Year 2 operations will include the completion of research surveying (hydrographic and fishing) and a depletion experiment to estimate relative abundance per unit habitat area.

2.0 INTRODUCTION

The Exclusive Economic Zone (EEZ) of the Republic of Tuvalu covers approximately 600,000 km^2 (Fig. 2-1). The Government of Tuvalu considers marine resources their most important natural asset, and realize that exploitation of deepwater bottomfish resources could provide potential economic development. Tropical deepwater bottomfish however, have a long life span, slow growth rate and variable larval recruitment, which make these species highly susceptible to over-fishing. Therefore, to scale a viable long-term commercial fishery, the sustainable yield of bottomfish stocks within the EEZ must first be estimated. Unfortunately , the duration of the present bottomfish assessment program is too short to allow bottomfish population modelling using traditional dynamic production approaches. Therefore, to calculate MSY for the Tuvaluan EEZ, the unexploited stock size must first be estimated. To estimate the unexploited stock size in the Tuvalu EEZ, the relative numbers and weight of bottomfish per unit of habitat area will be estimated from a depletion experiment, and this figure will be applied to an estimate of total productive habitat in the archipelago. Hydrographic surveying and research test fishing will provide the habitat estimate.

This report summarizes the activities performed in Year 1 of the biological assessment phase of the project.

3.0 TRAINING - YEAR 1

The Tuvaluan bottomfish resource assessment program commenced 20 May 1992 with a data collection/entry training session given by RDA personnel and held at the fisheries offices in Tuvalu. The two-day classroom session covered the rationale and application of data collection procedures and was combined with a one-day local training cruise to test fishing equipment and data collection procedures.

Data collection and field sampling began on 25 May 1992 with a three-day training cruise to Vaitupu and Nukufetau. A second training cruise to test hydrographic and fisheries data collection procedures occurred May 28-30 1992. A second classroom training session given by RDA personnel covered fisheries data entry and hydrographic data collection and analysis and was held in Tuvalu from 31 May through 2 June 1992.

Two fisheries personnel from Tuvalu traveled to Honolulu, Hawaii to attend the RDA Bottomfish/Baitfish Workshop 17-25 November 1992. Training in fisheries data compilation and analysis, graphical data presentation and fisheries economic analysis was given by personnel from RDA, the U.S. National Marine Fisheries Service and the South Pacific Commission.

The above training sessions, in combination with continuing training at sea has allowed 20 local Tuvaluan fishermen to become proficient in bottomfishing techniques and data collection/entry and analysis procedures.

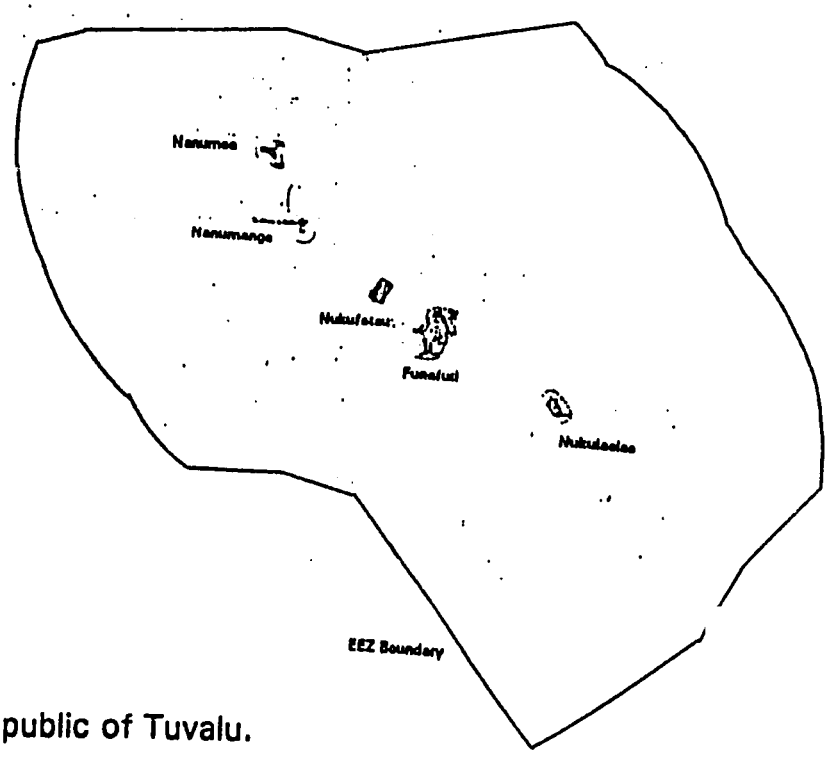

Figure 2-1. Republic of Tuvalu.

4.0 BIOLOGICAL ASSESSMENT - YEAR 1

4.1 Hydrographic Program

Seventeen research cruises were completed during the first year of the Tuvalu bottomfish assessment project using the Government of Tuvalu vessel, the *R/V Manaui*. Eleven different geographical areas (Fig. 4-1) were hydrographically surveyed and systematically fished to provide information on local bathymetry, species composition, length frequency, catch rates and depth distributions.

Fifty one data sets were compiled from the data collected during the first year. These data were brought to the Bottomfish/Baitfish workshop for analysis. During the workshop, the data was converted from a DBASE IV format to a more usable Lotus or Quattro Pro spreadsheet format. Further analysis was done using the SAS statistical package. Hydrographic data was analyzed and plotted using Quattro Pro and SURFER plotting software.

A total of 1,778 hydrographic measurements were taken using a GPS positioning unit and a color sounding chromoscope. From this data, eleven hydrographic chartlets of areas fished were produced and plotted (e.g Fig. 4-2). Approximately 60-70% of fishable habitat in the Tuvaluan Archipelago was surveyed (hydrographic and research fishing) during Year 1. The hydrographic data was digitized using an electronic template to allow preliminary estimation of the length of the 200 m contour for each seamount or bank system. During the course of fishing and hydrographic operations, two small seamounts (Luao and RDA) were located and charted (Figs. 4-2, 4-3). The small size and isolated nature of RDA seamount make this area suitable for a CPUE depletion experiment. It is estimated that the removal of 2,000-3,000 fish from this area would be required to deplete the population sufficiently to allow depletion modelling. This number of fish is within the range of catch that could be expected to be harvested by a single commercial vessel operating at the area during a fishing season. Data from the depletion (fishing down) experiment will be combined with an estimate of the length of the 200 m contour for the archipelago (from hydrographic survey data and existing bathymetric charts) to allow maximum sustainable yield (MSY) of bottomfish for the Tuvaluan seamounts to be estimated.

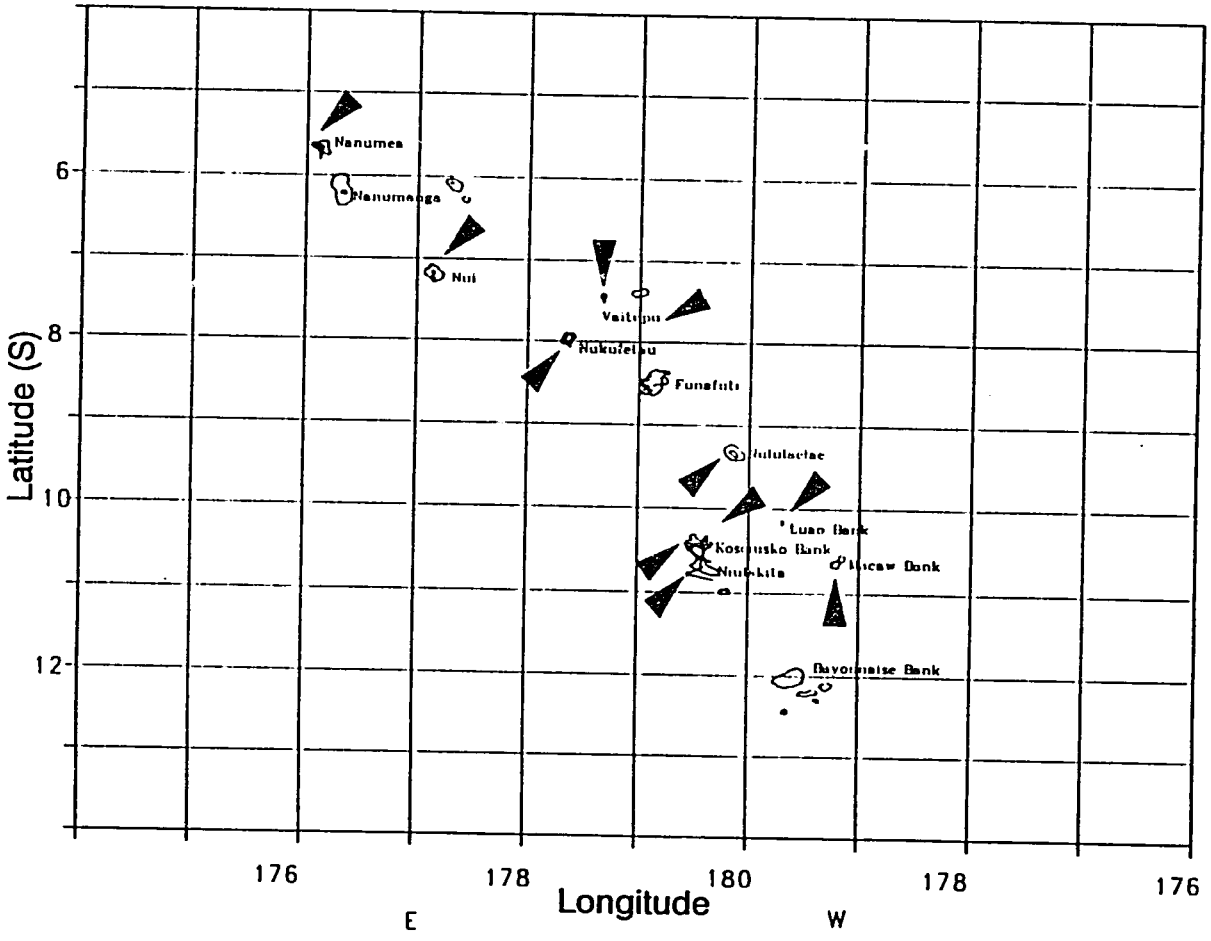

Figure 4-1. The islands, banks and seamounts of Tuvalu. Arrows denote Year 1 (1992) survey areas.

Figure 4-2. Luao Bank. Position omitted for confidentiality.

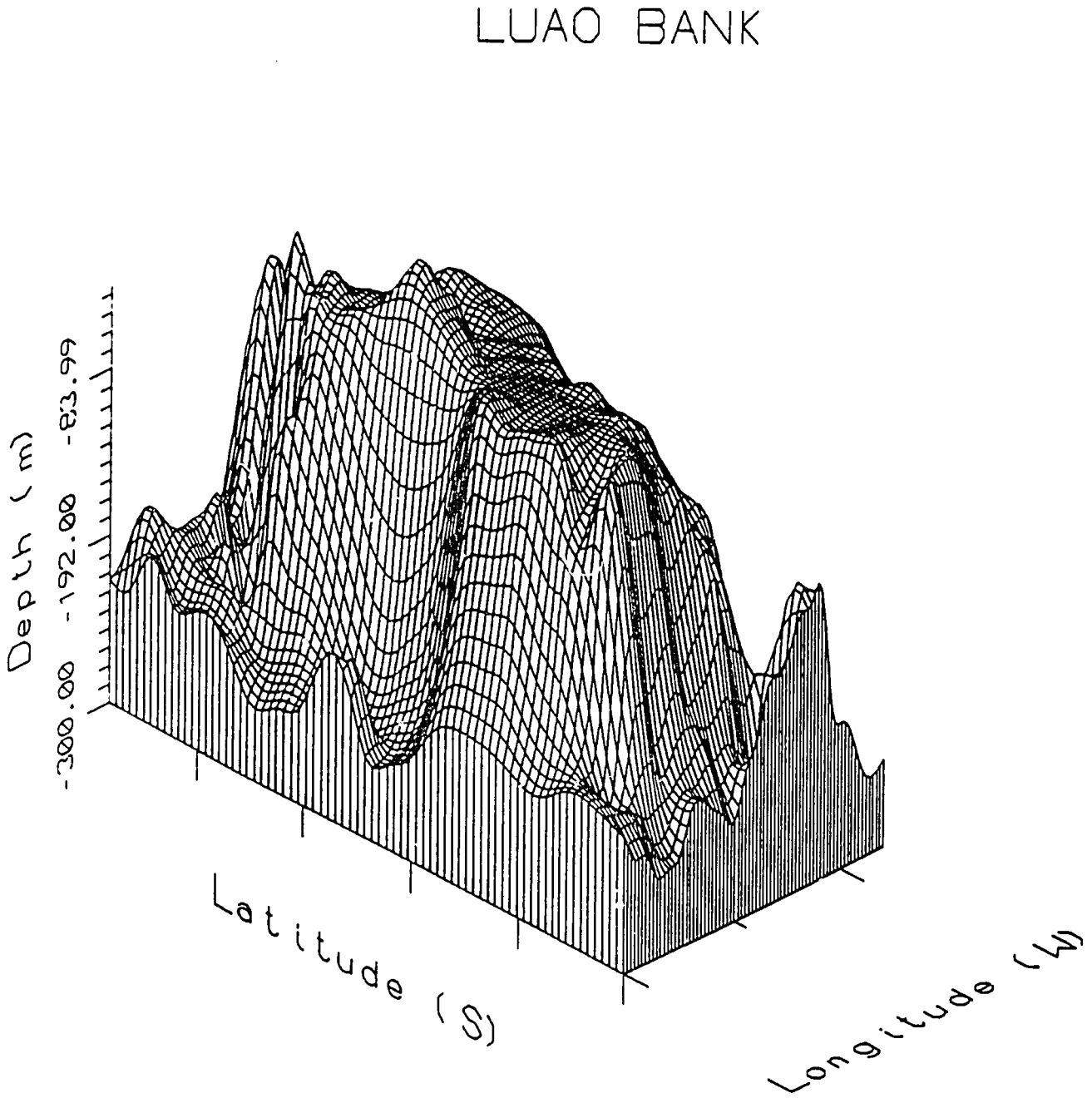

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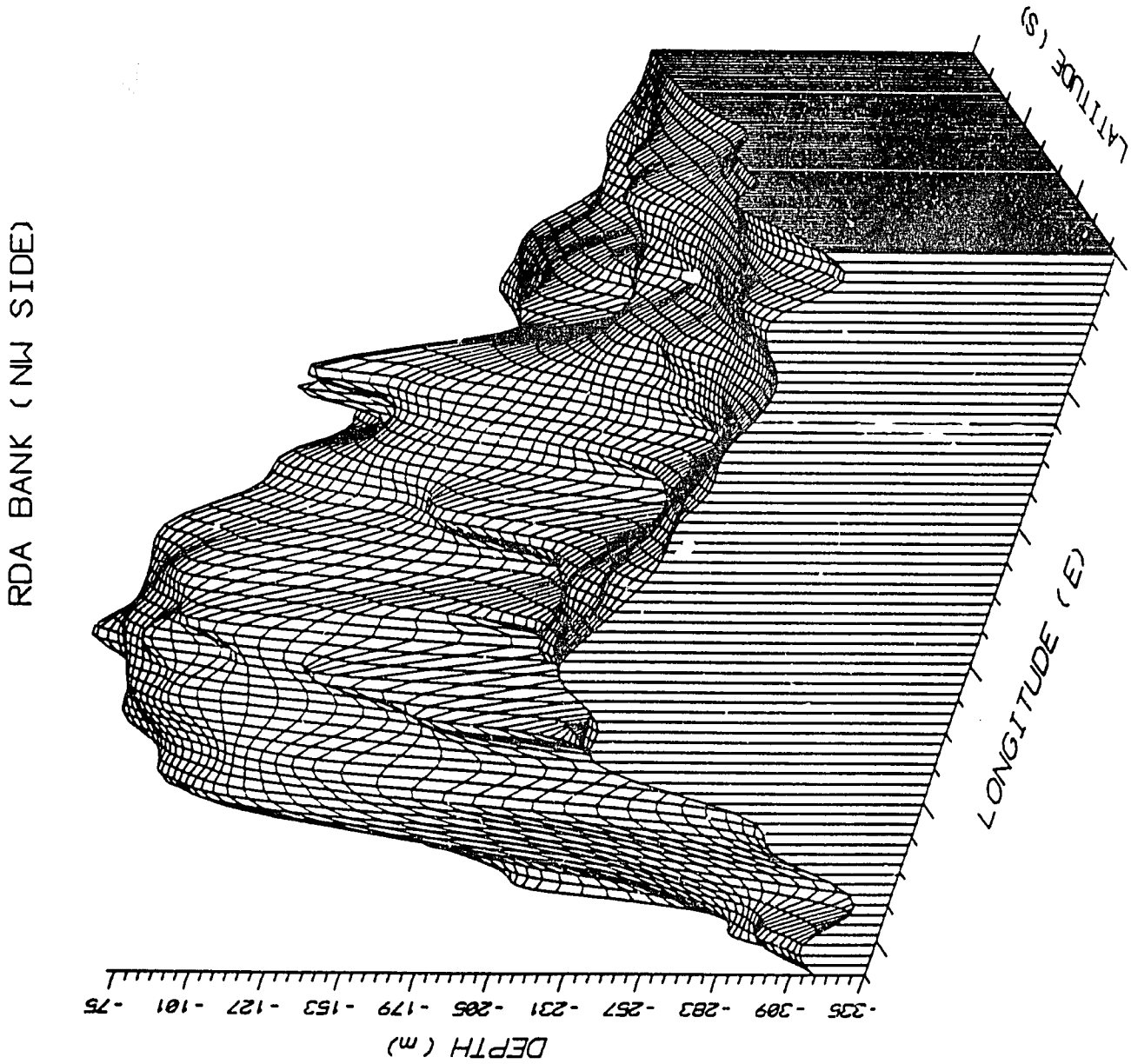
Figure 4-3. RDA Bank. Position omitted for confidentiality.



4.2 Research Fishing

During 1992 fishing operations, a total of 7,324 kg of fish of 44 different species were caught. Of this total, 24 species were marketable, with a total weight of 6,037 kg (Table 4-1). Length frequencies of the principle Lutjanid species are shown in Fig 4-4. Three species, *Etelis carbunculus, Etelis coruscans* and *Caranx lugubris* made up the majority of catch by weight. The average CPUE of all species was 6.10 kg/line-hour, and 5.03 kg/line-hour for marketable species. These CPUE values are good by regional standards, and it should be noted that they probably represent the lower bound of a commercial CPUE range, as research fishing is usually not as directed or intense as commercial fishing.

5.0 FISHING GEAR

Bottomfishing operations in Year 1 used Samoan type handreels exclusively. The current generation of gear used aboard the *R/V Manaui* is performing to specifications and will need very little further modification.

6.0 PROSPECTUS - YEAR 2

Research operations in Year 2 will consist of a continuation of hydrographic surveying, especially at the southern seamounts; continuing survey fishing operations; and a CPUE fishing down experiment. The successful completion of the above relies on the availability of two fishing vessels for the 1993 fishing season. One vessel, however, could be operated as a commercial venture, if catch and effort information were documented for each fishing trip. The successful completion of both research surveying (hydrographic and fishing) and the depletion experiment in Year 2 must address the following constraints: the requirement for two crews (research and depletion experiment) to operate simultaneously, and the foreseeable unavailability of two vessels for the duration of Year 2. If vessel or personnel availability constrain the project in Year 2, top priority should be given to the completion of research hydrographic and fishing surveys. If necessary, data from similar seamount locations (e.g. Fiji or Tonga) will be used to provide the estimate of relative number and weight of bottomfish per unit area to be used in MSY calculations.

Table 4-1. Total catch by number and weight (marketable species only)

SPECIES	NUMBER	WEIGHT (KG)	PERCENT BY WEIGHT	PERCENT BY NUMBER
A. furcatus	5	11.3	0.19	0.26
A. rutilans	160	484.7	8.03	8.30
A. virescens	18	73.2	1.21	0.93
E. carbunculus	190	1230.0	20.37	9.86
E. coruscans	165	920.5	15.25	8.56
E. radiosus	6	34.5	0.57	0.31
P. lausakarii	60	133.6	2.21	3.11
P. auricilla	104	95.2	1.58	5.40
P. filamentousus	200	404.1	6.69	10.38
P. flavipinnus	188	298.2	4.94	9.76
P. multidens	35	68.5	1.13	1.82
P. zonatus	355	294.6	4.88	18.42
E. areolatus	4	16.0	0.27	0.21
E. chlorostigma	9	20.5	0.34	0.47
E. fasciatus	2	2.0	0.03	0.10
F. morrhua	73	264.3	4.38	3.79
E.septemfasciatus	11	542.4	8.98	0.57
V. louti	16	24.9	0.41	0.83
V. albomarginata	8	11.2	0.19	0.42
Other grouper	11	30.8	0.51	0.57
C. ignobilis	5	43.6	0.72	0.26
C. lugubris	253	882.7	14.62	13.13
S. susmerili	14	42.6	0.71	0.73
S. rivoliana	35	107.9	1.79	1.82
TOTAL	1927	6037.3	100%	100%

Figure 4-4. Length frequencies of the principle Lutjanid species caught in the Tuvaluan seamount bottomfish fishery.

Appendix A - MARINE BIOLOGIST DAILY ACTIVITY SUMMARY YEAR 2, TRIP 1

1993

19 February - En route Honolulu, Hawaii to Funafuti, Tuvalu.

20 February - Arrived Funafuti. Met with RDA project personnel to plan trip activities. Met with Masterfisherman to discuss logistical requirements. Recap of Year 1 data collection. Began DBASE data conversion.

21 February - Continued data conversion and began hydrographic plotting of uncharted areas.

22 February - Met with RDA personnel and U.S Peace Corps discussed marketing, personnel. Plotted 3-D views of areas suitable for depletion experiments Held classroom training workshop on data collection methods/continuity and equipment for new and returning personnel.

23 February - Trained Peace Corps volunteer and one Tuvalu Fisheries personnel in DBASE program updating and data conversion. Plotted navigation charts for research cruise. Departed Funafuti for research training cruise to RDA Bank.

24 February - Research training cruise. Vertical and horizontal longline operations, data collection training and bottomfishing training at RDA bank. Departed RDA Bank for Funafuti.

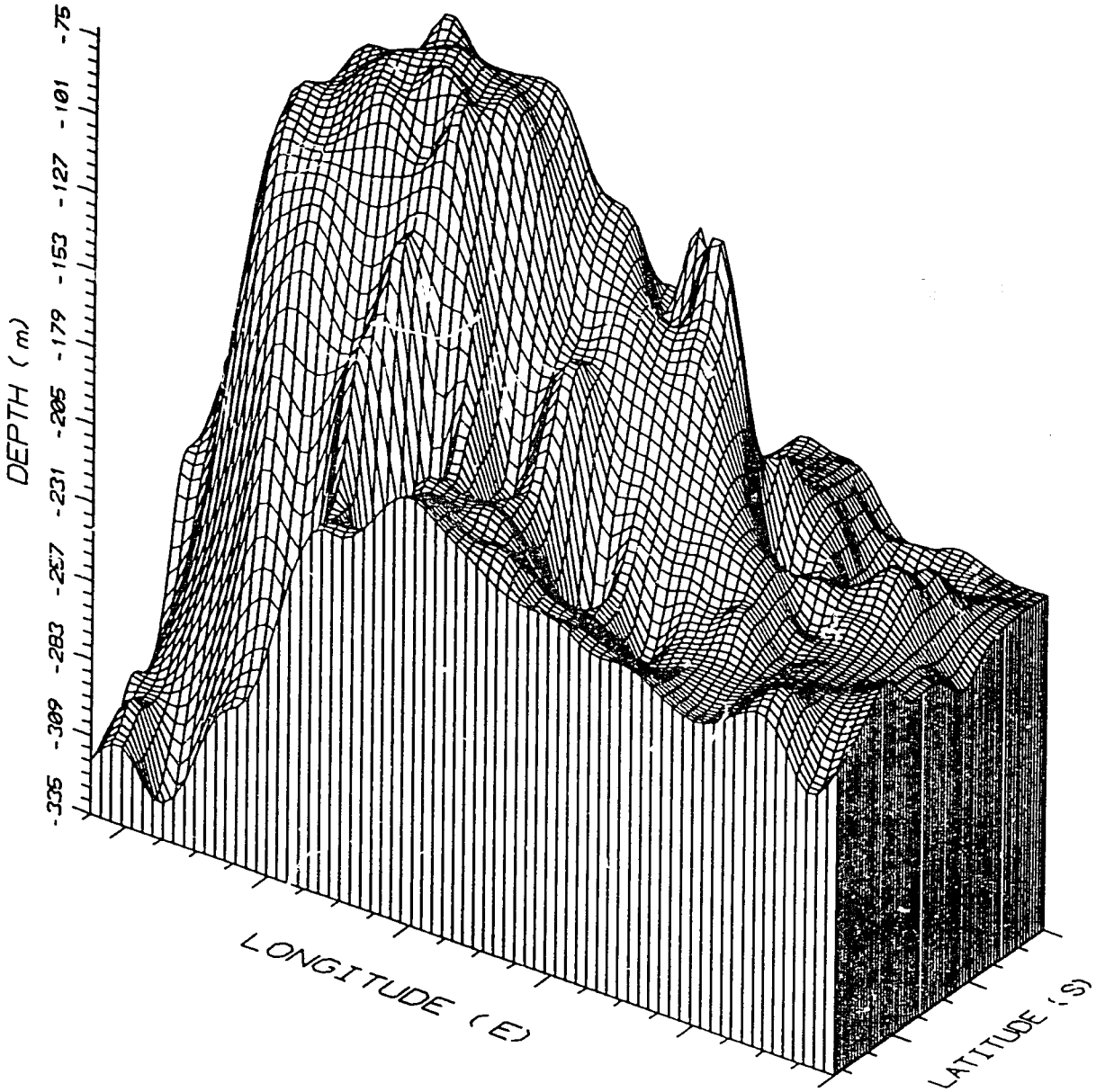
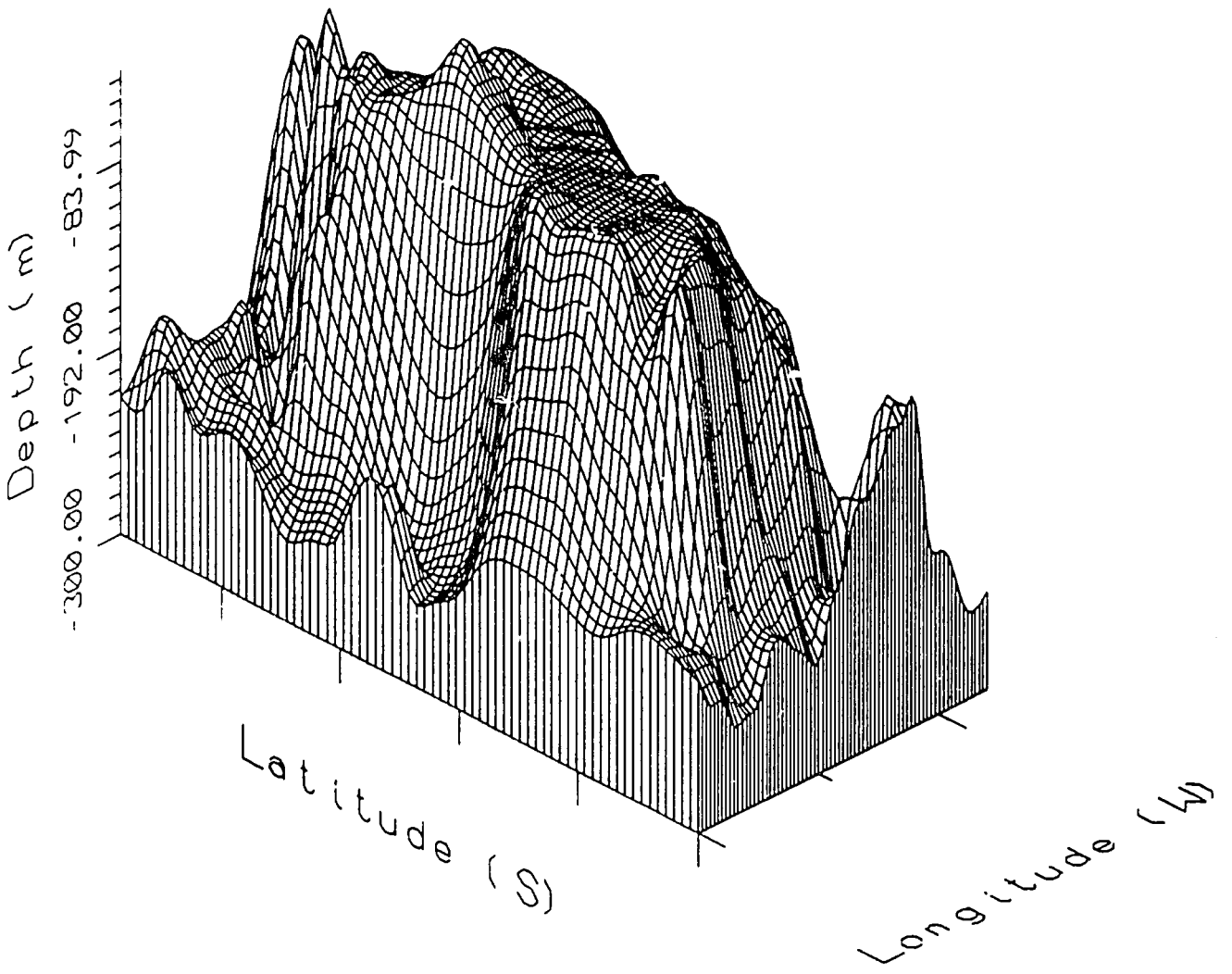
25 February - Arrived Funafuti. Trained two Fisheries personnel in data entry/summarization. Reconfigured RDA office computer for WINDOWS operation. Trained Peace Corps volunteer and one Fisheries personnel in DBASE fishing effort summarization. Worked on longline data entry format.

26 February - Trained new personnel in DBASE data entry and editing. Entered training cruise data. Created longline data entry spreadsheet. Departed Funafuti for Nandi, Fiji.

27 February - Reviewed project notes, began report summary.

28 February - Departed Nandi for Honolulu, Hawaii. Arrived Honolulu.

RDA BANK (NW SIDE)



LUAO BANK