

**Bottomfish CPUE Standardization Workshop  
Proceedings**

**August 4-6, 2008<sup>1</sup>**

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## Preface

To improve the quality of bottomfish stock assessments in the Pacific Islands Region, the Pacific Islands Fisheries Science Center convened a Bottomfish CPUE Standardization Workshop during August 4-6, 2008. The workshop was attended by a diverse group of invited participants from the Hawaii bottomfish community: fishermen, scientists, gear technology specialists, and fishery managers. Following the workshop, an informal report of the proceedings was prepared and distributed to participants and others closely involved in management of the fishery. Recently, the unpublished workshop report has been cited in a public document describing a stock assessment of bottomfish in the main Hawaiian Islands. Accordingly, the report is being issued here to make it more accessible.

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## **Bottomfish CPUE Standardization Workshop Proceedings August 4-6, 2008**

### **Introduction**

Several species of deep-slope bottomfish are the target of a small scale local fishery in the Hawaiian Archipelago with recent annual landings of approximately 500,000 pounds and an ex-vessel value of approximately \$1.4 million. This fishery has been conducted on a commercial basis since at least the turn of the 20<sup>th</sup> century. Currently, participants in the fishery are a complex mix of subsistence, recreational, and commercial fishermen. The fishery primarily focuses on a complex of seven species of eteline snappers and a single grouper caught at depths of 30-150 fathoms by small boats using hook-and-line gear.

For the purpose of managing this multi-species complex, the Hawaiian Archipelago is divided into three management zones (Fig. 1). In the main Hawaiian Islands (MHI), the bottomfish fishery is primarily under State of Hawaii jurisdiction and supports many subsistence, recreational, and commercial fishermen (nearly 500 commercial fishermen reporting catches in the mid 1980s and just over 300 in 2007). The Northwestern Hawaiian Islands (NWHI) is divided into two management zones, the Mau and the Ho'omalau, both of which are primarily under Federal jurisdiction and support limited-entry commercial fisheries with little or no non-commercial fishing.

Stock status determinations are made on the archipelagic multi-species complex as required under the Bottomfish and Seamount Groundfish Fishery Management Plan of the Western Pacific Regional Fishery Management Council (WPRFMC). Stock assessments which rely almost exclusively on commercial catch data collected by the State of Hawaii are the basis of these determinations. The State's data set includes records of commercial fisheries from 1948 to the present. Over this period of time many changes have occurred in the fishery and in the way data was reported. These changes over time undoubtedly impact the interpretation of the data particularly in terms of deriving a standardized estimate of catch per unit effort (CPUE) that would properly reflect changes in stock abundance over time.

A workshop was convened on Aug 4-6, 2008 to address these issues. The workshop brought together scientists from the Pacific Islands Fisheries Science Center (PIFSC), Hawaii Department of Aquatic Resources (HDAR), and WPRFMC. Input from commercial bottomfish fishermen was provided from a series of informal fishermen interviews. The agenda for this meeting is included as Appendix I.

### **State of Hawaii Commercial Fisheries Report System**

The workshop opened up with a thorough explanation of the State of Hawaii Commercial Fisheries Report System (CFRS) presented by Reginald Kokubun (Appendix II). Since the HDAR data are the basis of our CPUE estimates a thorough understanding of the data is critical to our stock assessments. Topics brought up in

discussion included changes in the data collected and its quality over time, frequent updating of the data providing several slightly different data sets even over a short period leading to confusion between fishery statistics presented for a particular year in different reports (or even different sections of a single report), and QA/QC procedures.

The HDAR CFRS data set covers the years 1948 to present and is the only data set available to provide catch and effort information, and therefore an index of abundance, for the Hawaiian bottomfish fishery. Commercial fishermen are required by State law to submit monthly catch reports by the 10<sup>th</sup> day of the following month. In theory these reports include all fish caught by species and fishing day. In practice many fishermen reported only fish sold and recorded the date sold. This would result in under-reporting of the catch by that portion not sold and could underrepresent effort if a multiday trip was reported under a single date. As an extreme example of underreporting effort, some fishermen apparently reported the entire month's catch (whether sold or total) under a single date entry. There are other data limitations which are covered more thoroughly in Appendix II. These include missing data in important fields (e.g. CML, area, or date), lack of reporting "no catch" trips, poor data processing quality control for early years, insufficient effort information requested in early years, and general non-compliance with the reporting requirements. Table 1 provides a timeline of important changes in HDAR data collection.

**Based on the above discussion, the workshop participants made a couple of recommendations. First, a consensus was reached that the HDAR data set be archived each year in April and that this archived data set be used for all bottomfish analysis conducted during that year. This would alleviate that problem of different data sets being used for reports in a single year. Second, if re-entry of data from early years is deemed necessary, that these years be prioritized and that funds and personnel be identified to carry out the mission. The data re-entry job would be very difficult and time consuming.**

### **Review of Current Data Screening Processes for Stock Assessment**

Under the current system reported total annual landings values are summed on an annual basis for all BMUS catches regardless of the type gear used. In addition, catches in the generic "ulua" species category are allocated between the various BMUS and non-BMUS ulua species based on the proportions of these BMUS to non-BMUS species obtained during years with reasonably complete ulua species identifications. For MHI CPUE analysis, bottomfishing days are defined as dates reported by a particular CML on which landings are comprised of 90% or more BMUS species (catches of kahala and ta'ape excluded). Next, annual bottomfish landings (less kahala and ta'ape) on qualified bottomfishing days are calculated by licensee for the Maui Nui fishing areas. The median of the annual landings of these top ten licensees is then calculated. Standardized MHI CPUE calculations are made by summing BMUS catch (less kahala and ta'ape) and days of effort on qualifying bottomfishing days for all MHI licensees, regardless of area fished, whose qualifying annual landings were 30% or more of the median of the top ten Maui Nui (Maui, Molokai, and Lanai) licensees. Standardized effort is then obtained by

dividing total BMUS landings (regardless of gear used, but excluding kahala and taape catches) by the standardized CPUE of qualifying fishermen obtained above. (See Moffitt, et al. 2006 for more detail).

**The workshop agreed that for future analysis that the exclusion of kahala and taape from BMUS landings used in CPUE calculations should continue. The participants also concurred that additional screening methods should be investigated. These could include redefining a bottomfish day as something other than a 90% BMUS catch day or the tracking of individual highliner licensees over time. All participants agreed that a process generating CPUE with a greater spatial component would be desirable.**

### **Changes in Technology and Fleet Characteristics**

The next topic discussed involved changes in the fleet and fishing technology that may have an impact on fishing power and therefore how reported catch and effort data is interpreted. Much of the input for this section was derived from a series of interviews conducted with some bottomfish fishermen on Oahu and Maui. Most of the fishermen interviewed were longtime bottomfish fishermen themselves and many belonged to families with an even longer history of bottomfishing. Appendix III lists the basic questions asked during the interviews. Table 2 is a timeline summarizing the output of these interviews regarding major changes in the fishing fleet and the technology used.

The bottomfish fishery in the 1940s and 50s can be characterized in general terms as follows. Most of the commercial bottomfish fishermen were full-time fishermen. Vessel size varied considerably from canoes to much larger sampans. The smaller vessels generally operated on single day trips while the larger vessels generally fished multiday trips. Navigation was by landmarks with depth determined by dropping a lead line (e.g. a normal bottomfish rig). Lines were apt to be natural fiber lines and were hauled by hand. Both drift and anchored fishing occurred with anchoring (and use of palu) generally preferred. The number of hooks varied from 4 to as many as 20 with the preferred number varying between fishermen and by the species and depths fished. A frequent fishing pattern was to target onaga in the deeper water by day and opakapaka at shallower depths at night.

General fishing techniques have remained relatively constant over the last 60 years. Bottomfishing still involves finding the fishing site, anchoring on or drifting over the site, and dropping a hand held line with baited hooks. What has changed has been the efficiency of these activities through advances in technology. Advancements in navigation from line of sight through Loran, Omega, and Sat. Nav. to GPS plotters has greatly improved the fisherman's ability to return to a known fishing site quickly even at night when landmarks are often obscured. This reduction in search time is substantial, on the order of a 50% savings in time, and less time searching can translate to more time fishing. Similarly advances in depth sounders from lead lines through pingers, paper charts, to monochrome displays and finally chromoscopes have contributed to reductions in search time, allowing the fisherman to fine tune site selection to desired depths. In

addition, these depth sounders have improved the fisherman's ability to "see" the bottom features and even signs of fish, a great benefit when searching for new fishing sites. Advances in the fishing lines have also occurred. Synthetic lines have less stretch and a greater strength to diameter ratio giving the fisherman a better feel for the bite and therefore a greater hooking rate. Modern synthetic lines (e.g. spiderwire, powerpro, or spectra) give the ultimate in these characteristics, providing a greater hooking rate and, due to the narrow diameter of the line, a longer bottom time (reduced drifting of the line with currents). On the down side, the lack of stretch for these lines can lead to an increased loss of fish on retrieval. Finally, the use of power assisted line hauling instead of hauling by hand has greatly increased the line turn around time, increasing the number of line drops in a day by as much as four fold. The choice of power assistance tools varies between fishermen. Some use reels others use pinch pullers with electric or hydraulic power sources being the most popular.

All of the above advances in fishing equipment alter the rate of fish capture in one way or another (i.e. reduced search time, increased hookups, or quicker gear retrieval). Unfortunately, the HDAR data set does not capture any of these changes in equipment. In the best case scenario, we are able to extract a daily catch rate for each reporting fisherman. Any improvement in the fisherman's ability to catch fish through use of advanced technology would alter the relationship between CPUE and abundance. In order to provide an appropriate stock assessment we need to interpret and account for these changes in the relationship.

Changes in Hawaii's bottomfishing fleet over the last sixty years are not limited to advances in fishing technology. In the 1950s and 60s fishing was the primary income for many of the commercial fishermen. Many of the highliner fishermen fished moderately large sampans. Starting in the late 1960s and early 70s with the coming of prosperous times and the production of relatively inexpensive trailerable vessels, the nature of the fleet shifted away from full-time fishermen in the larger sampans to part-time fishermen in smaller trailer boats. This shift could affect reported catch rates in a couple of ways.

First, as with many fisheries, newcomers to the bottomfish fishery often experience poor initial catch rates. As the fisherman gains experience in the fishery, his catch rates increase. Some few fishermen become true experts in this fishery. The changes in catch rates for these fishermen during the learning period reflect changes in ability not stock abundance. When many fishermen enter the fishery at the same time they would bring down the average catch rate of the fleet, which on casual inspection might imply a reduction in stock abundance.

Secondly, other attributes of smaller vessels may impact reported catch rates. Smaller vessels have limited ice and fish holding capacity, limiting the amount of fish they can catch in a single trip. Also, smaller vessels are much more apt to conduct shorter duration trips than larger vessels. Whereas these differences should not affect catch rate when measured in terms of fish caught per line per hour as reported in the most recent years, they can make a large difference in catch per trip which is the measure of CPUE

recorded over the vast majority of the reporting period and what is used in our assessment models.

**Participants of the workshop agreed that changes in the catchability coefficient corresponding to major changes in technology and fleet dynamics (Table 2) should continue to be included in future assessments.**

### **Other Factors Impacting CPUE Interpretation**

The workshop participants discussed other factors that might influence reported CPUE. The goal was to identify existing data sets that might be added to future assessment models. As mentioned above, vessel characteristics might impact CPUE. Vessel length and horse power of the engine are two characteristics that are reported when vessels are registered with the State. It is hoped that historical records are available that would allow coupling these characteristics with specific bottomfishing vessels.

Oceanographic conditions also impact CPUE by either changing productivity of the stock or by affecting the fisherman's ability to catch fish (e.g. high winds or strong currents). Sea surface height information has already been incorporated in the last models used by Brodziak (2008). It is likely that historical information on wind speed is available from the Weather Service. Similarly, data on catastrophic events (e.g. typhoons and tidal waves) should be available.

Socio-economic factors may also influence CPUE. As stated above, the ability of fishermen to catch bottomfish varies considerably with only a few becoming true experts. The commercial fleet size can easily be obtained from the HDAR data set. Demand for bottomfish products in Hawaii may influence whoever enters or remains in the fishery. Various metrics might reflect this changing demand. Average bottomfish price would be one metric. It might also be interesting to include tourist records (e.g. Japanese tourist count) or sales of fish to hotels (if available). Another factor might be the unemployment rate for Hawaii. When times are hard more people are apt to fish to make up for lack of income.

**Inclusion of the above factors in future stock assessments is a medium to long term goal.**

### **References**

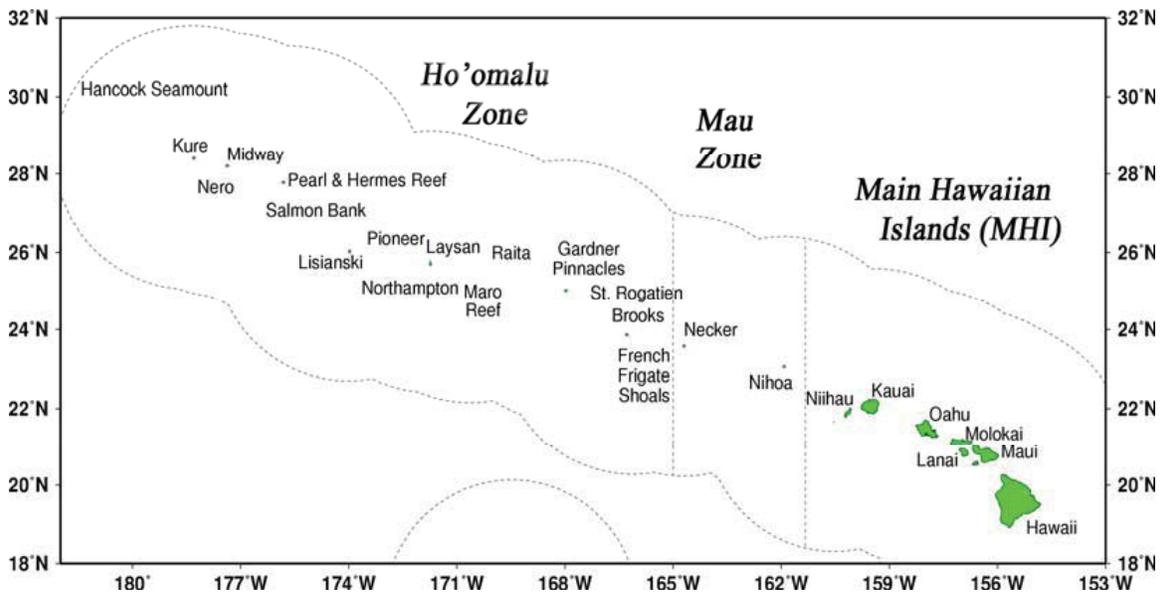
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**Figure 1. Hawaiian Archipelago Bottomfish Fishery Zones**



## **Table 1. Timeline of HDAR Data Collection**

**1929**

Commercial Marine Licenses (CML) introduced – applied only to foreign nationals

**1947**

CMLs issued to all commercial fishermen

**1948**

First available computerized fisherman catch reports available from this year – some earlier data reports with unknown coverage may be available but has not been computerized to date  
Licensing and report booklet distribution handled by DOCARE

**1950s**

Four digit area codes used for NWHI sites – late 1950s and 1960s

**1960s**

Historical data (starting with 1948 data) punched in bulk in 1962 – little if any QA QC, this data is of questionable quality (e.g. missing fields, duplicate records, miskeyed entries)

**1970s**

**1980s**

New and more detailed NWHI area codes introduced in 1983  
Kokubun joins HDAR in 1989

**1990s**

Licensing and report collection transferred from DOCARE to HDAR in 1990  
Change to a PC dbase application for data storage in 1995 – Zero catch trip included from this point on

**2000s**

Dealer data digitized in 2000  
MHI data sheets changed to include more effort information in 2002  
Global QA QC screening process initiated in 2005-6  
Real time updating and correction of data – data set may change in real time

**Table 2. Timeline of Bottomfish Fishery Characteristics Based Largely on Fisherman Interviews**

**1940s**

Lines hauled by hand  
Natural fiber lines  
Landmark navigation  
Lead line depth determination  
Fleet largely of full-time fishermen, vessel size varied but many large sampans, large vessel apt to have multiday trips

**1950s**

Lines hauled by hand  
Natural fiber lines  
Landmark navigation  
Lead line depth determination

**1960s**

Lines hauled by hand  
Synthetic lines (grey line and bloodline) – less stretch, improved hooking ability  
Landmark navigation  
Early depth sounders – reduce search time for known sites by half, improve search for new sites  
Banana Patch and other fiberglass vessels join the fleet

**1970s**

Change to assisted lines hauling in late 1970s to mid-1980s (hydraulic pinch pullers, hydraulic reels, electric reels) – increase number of drops per hour by 2-4 times  
Synthetic lines (grey line and bloodline) – less stretch, improved hooking ability  
Landmark navigation  
Early depth sounders  
Large increase in small boat owner (part-time fishermen) from early 1970s through mid-1980s, more single day trips, probable increase in recreational fishery pressure

**1980s**

Change to assisted lines hauling in late 1970s to mid-1980s (hydraulic pinch pullers, hydraulic reels, electric reels)  
Synthetic lines (grey line and bloodline) – less stretch, improved hooking ability  
Loran used by some fishermen in addition to landmark navigation – reduce search time by a further 10%, used mainly for site location at night  
Chromoscope depth sounders become available in early 1980s – reduce search time by an additional 50%, allow fishermen to “see” fish prior to dropping lines, useful in finding new sites

**1990s**

Assisted lines hauling (hydraulic pinch pullers, hydraulic reels, electric reels)  
Synthetic lines (grey line and bloodline) – less stretch, improved hooking ability  
GPS navigation commonly used – reduce search time by a further 30-50%, eliminates need for landmark navigation

GPS plotters become available in early 1990s – greatly improve fishermen’s ability to “see” fish prior to dropping lines, useful in finding new sites, high expense so limited use

Many Oahu (and other?) highliners have left the fishery by 1998 (old age, MPAs, etc.)

Improved synthetic lines (e.g. firewire) available – much less stretch, greatly improve hooking ability but increase fish loss during haul

## **2000s**

Assisted lines hauling (hydraulic pinch pullers, hydraulic reels, electric reels)

Improved synthetic lines (e.g. firewire) – continued popularity

GPS navigation

GPS plotters available – not all fishermen use these

Additional USCG requirements – may be a factor in reducing participation

## Appendix I

# BOTTOMFISH CATCH PER UNIT EFFORT WORKSHOP

August 4-6, 2008

Pacific Islands Fisheries Science Center

## Draft Agenda

### August 4 (Monday), 0900 - 1700

1. Opening of Bottomfish CPUE Workshop
  - a. Welcoming Remarks
  - b. Introductions
2. Approval of agenda and assignment of rapporteurs
3. Approval of Terms of Reference
4. Data Quality Issues
  - a. Discussion of data collection changes over time
  - b. Discussion of changes in data quality over time
5. Fishing Practices & Technological and Gear Changes
  - a. Discuss with fishermen how fishing practices have changed over time.
  - b. Identify when major technological changes occurred in the fishery.
6. Factors affecting Catch
  - a. Based on discussions with industry what factors affect catch, and are they measurable?

### August 5 (Tuesday), 0900 - 1700

7. Data Issues
  - a. Current screening practices
  - b. Current QA/QC practices
  - c. Availability of data – are key datum identified above being collected
  - d. Scaling – define appropriate spatial scale of data

**August 6 (Wednesday), 0900 – 1700**

8. CPUE Approaches
  - a. Identify input data
  - b. Develop protocols for data treatment
  - c. CPUE time series for future assessments
    - Current methodology
    - Other approach (i.e., GLM)
9. Assignments
10. Adjournment

Appendix II

# **Commercial Fisheries Report System Documentation:**

**Fishing Report**

**Fish Dealer Report**

**Commercial Marine License**

**Data Processing**

**Prepared for Bottomfish CPUE Workshop**

**PIFSC**

**August 2008**

## INTRODUCTION

The purpose of this reference material is to document the commercial fisheries report system maintained by the Division of Aquatic Resources (DAR), Department of Land and Natural Resources, State of Hawaii. It serves as a reference guide to briefly chronicle the development of the commercial fisheries report system with technical support provided by WPacFIN, NOAA Fisheries. Documentation coverage includes commercial fishing license, historical and current fisheries reports, description of data fields, data limitations, and data processing methodology practices. For practical purposes, the entire coverage is devoted only to non-commercial aquarium reporting systems. This documentation is prepared upon request of the main Hawaiian Islands Bottomfish Catch Per Unit Effort Workshop held at the Pacific Island Fisheries Science Center by the stock assessment group on August 4 through August 6, 2008 (Agenda Item 4. Data Quality Issues).

## **Commercial Marine Fisheries License and Permit Requirement**

According to State statutes, the commercial marine licenses (aka: commercial fishing licenses) first became a requirement in 1929 (§189-2, Hawaii Revised Statutes). Only fishers of alien status were required to obtain licenses. In 1947, the statute was amended to include all commercial fishers. At that time, Fish and Game issued license tags to fishers. Prior to July 1990, The Division of Conservation Resources Enforcement (DOCARE) manually issued fishing licenses using multiple NCR forms and distributed the fishing report booklets to fishers. During the late 1980s DAR initiated steps to assume the fishing license responsibilities from DOCARE. The purpose for this change was to automate the license issuance operation and fish report submission procedures, and to provide DAR with an opportunity to explain to fishers the importance of the fisheries data and how to properly complete the report form. In July 1990, DAR assumed commercial marine fisheries license and permit responsibilities from DOCARE and began issuing the following licenses and permits:

- **Commercial Marine License** – allow fishers to take and land marine life in the State for commercial purposes; monthly fish report required (Appendix II.1)
- **Bait License** – allow commercial marine licensees to take regulated baitfish species for their fishing operations; licensee required to report baitfish harvest on fish report
- **Northwestern Hawaiian Islands (NWHI) Taking Permit** – allow commercial marine licensee to use regulated gear and take regulated species in the NWHI; permit holder required to report fishing effort and catch on fish report; the permit was discontinued in 2000 with closure of federal NWHI lobster trap fishery
- **Commercial Aquarium Permit** - allow commercial marine licensees to use small mesh net to take marine life for commercial purposes in the aquarium industry; licensee required to report aquarium harvest on aquarium fish report
- **Non-Commercial Aquarium Permit** - allow commercial marine licensees to use small mesh net to take marine life for non-commercial purposes; fish report is not required
- **Special Marine Product Possession and Sale License** – allow commercial fishers to take or businesses to import regulated marine life from non-state waters for commercial purposes; business licensees were required to report transactions on the source (import) and disposition

(retail outlets) of regulated marine life on a monthly basis; report requirement was suppressed a few years ago

- **Sale of Locally Caught Spiny/Slipper Lobster and Kona Crab License**  
– allow businesses to purchase lobster and Kona crab caught by commercial fishers during open season and sold to businesses during closed season by dealers; primary fish dealers who held this license were required to report purchase transactions during the open season on monthly fish dealer report; all licensees were required to report purchases (from whom) and sales (to other businesses) during the closed season; report requirement was suppressed a few years ago
- **Aquaculture Facility License** – allow facilities to collect regulated marine life, rear and culture the stock for commercial purposes; the license was converted in 2004 to merge with the pond operator’s license; in 2004, the monthly pond operator’s report was suppressed
- **Aquaculture Dealer License** – allow businesses who purchase the facility reared regulated marine life for re-sale purposes; the license was converted in 2004 to merge with the pond dealer license; report is not required
- **Main Hawaiian Islands Bottomfish Vessel Registration I.D.** – anyone who intends to take ‘Deep 7’ bottomfish species in the MHI for commercial or non-commercial purposes must register the fishing vessel; when the State MHI bottomfish management rule was established on June 1998; in 2004, when the CMLS Web portal system was implemented, the bottomfish vessel registration became automated

Until July 1993, the license was issued on a fiscal year basis, from July 1 through June 30. The license was valid from issuance date until June 30, and a new license number was assigned to the fisher. DAR implemented a new automated licensing system called Commercial Marine Licensing System (CMLS) on July 1993. From here on, permanent license numbers were issued to fishers, and the license was valid up to one year from issuance date. The fiscal year license expiration date was dropped.

### **Commercial Fish Report Requirement**

DAR has a long time series of ‘best available’ commercial fisheries dependant data collection. State law requires commercial fishers to submit reports by the 10<sup>th</sup> day of the following month (§189-3, HRS). Since 1948, commercial fishing reports have been data processed, archived, summarized in landing reports, and included in CPUE analysis for federal fisheries management plans. Several

items have been defined and standardized with codes including license number, gear/method, area fished, species, and landing port. The original record layout of the fishing report was unchanged for 54 years. The most significant additions were fish aggregation device letter designation and to whom sold information. In terms of report forms, the fish catch report is the standard form used by the majority of fishers. From 1948 through 1994, in addition to the fishing report, commercial landing data were collected on other fishery specific report forms:

- **Fish Catch Report** (Appendix II.2a)
- **Longline** (Appendix II.2b)
- **Aku boat** (Appendix II.2c)
- **Deep-sea handline**
- **Pond operator** (Appendix II.2d)

During the mid-1990s, the crustacean trap and albacore troll trip report forms were implemented. The crustacean trap form was primarily used to report the lobster landings from the federal permitted lobster trap fishery in the NWHI. The albacore troll form was used to report seasonal landings of albacore from vessels transiting through the State. The core data field requirements for these report forms are the same as the fish catch report. The inherent design of the report form was to collect fishing trip effort (date fished and trip end), total catch and ex-vessel landing data.

In 1995, a new set of report forms were specifically designed and implemented with assistance from NOAA Fisheries for the Federal NWHI bottomfish fishery. The report forms consisted of a daily log to report type and number of fishing gears used, time fished and total catch by day fished. Total catch included by catch or fish lost to predation and releases, dead alive. These report forms were processed through a FoxPro database application for PCs. Data entry and data quality control procedures were used. In addition, an algorithm to integrate the trip end sales with daily log report by species was developed to create a flat record file consisting of fishing effort, total catch and ex-vessel landing data. WPacFIN provided technical support to develop the database application. The DAR fisheries aide picked up report logs from federal permit holders who were home ported in Honolulu. These logs were processed on a fast-track basis. Since the total catch was verified against landed sales information, the information for this fishery was accurate, complete and reliable as compared to fishing reports submitted by other commercial marine license holders.

#### *Fish Report Data Limitations*

Conceivably there are many reasons why the fish report data has shortcomings as a useful tool for analysis. For one, the original data elements in the fish report

remained unchanged for just over 50 years, and it is important for researchers who use this information to understand the limitations of the fish report data. Outlined below are some of the limitations:

- Underreporting For the most part, trip level information is suspect and total catch was under reported.
  - In the early years, catches were summed at the end date of a trip, or in some cases for the entire month.
  - Many fishers only reported catches that were sold, and ignored reporting catches that were used for bait, released at sea, or lost to predation.
  - Even catches that were landed but given away or used for home consumption were not always reported.
- Design of Fish Catch Report Form is Flawed For multiple-day fishing trips, it is especially difficult to report by date fished; area fished; method; catch by species; and portion of catch sold along with ex-vessel value.
- Missing Did Not Catch Trips Fishing trips that did not produce any catch were not reported and processed.
- Missing Fishing Effort Information Report lacks number of gear unit; time fished and other indicators that affect effort and catch.
- Poor Data Processing Quality Control Historical fish report records lacked proper QC procedures; lacked data processing documentation.
- Licensing and Report Requirement Compliance Non-compliance to these requirements leads to underreporting of landings.

A major reason for the underreporting problem can be attributed to lack of an information and education program to explain the importance of the fisheries data, how it is used by fisheries management and how to properly complete the report. The report design flaw and lack of critical fishing effort indicators were addressed in a fish report revision project in the late 1990s. The 'Did Not Catch' report records were processed starting in 1989. A data rescue project to edit the historical fish report annual data files is underway. DAR continues to wrestle with enforcement alternatives to seek compliance with licensing and reporting requirements.

### *New & Revised Fish Reports*

On October 2002, the revised commercial fish reports were implemented. This represented the first major modification to the commercial fishing reports. To improve and enhance the collection of commercial fisheries data, the emphasis of the revisions was placed on reporting fishing effort indicators including, date fished, trip start and end date, number of gear units, time fished, and total catch. The improvements to the fishing report are expected to yield better CPUE analysis when a sufficient time series of reports have been accumulated. The ex-vessel landing information was removed and it is being collected from primary fish dealers. The following fish report forms were implemented:

- **Fishing Report** – standard report form used by nearly 90% of fishers (Appendix II.3a).
- **Aku Boat Trip Report** – trip report for live-bait tuna boat with pole and line fishing fulltime for aku (Appendix II.3b).
- **Deep-sea Handline Trip Report** – bottomfish report for fulltime fishers who fish at least 3 consecutive days at sea in the MHI (Appendix II.3c.)
- **Tuna Handline Trip Report** – tuna handline report and includes other methods such as troll, short line and vertical longline for fulltime fishers who fish at least 3 consecutive days at sea primarily in the offshore fisheries, i.e., Cross Seamount, NOAA weather buoys, etc (Appendix II.3d).
- **Net, Trap and Dive Activity Report** – report for fishers who fish the inshore areas using various net types, traps and diving activities. This report is most functional when reporting catches consisting of multiple species (Appendix II.3e).
- **Bait Report** – report for commercial non-aku boat fishers who obtain a bait license (Appendix II.3f).

### **Commercial Fish Dealer Report Requirement**

Fish dealers are required by State statute (§189-10, HRS) to submit commercial marine dealer reports, aka fish dealer reports on purchases of marine life obtained directly from commercial fishers for re-sale purposes to DLNR by the 10<sup>th</sup> day of the following month. When the commercial marine fisheries license and permit issuance responsibilities were transferred from DOCARE in July 1990 to DAR, this included the collection of fish dealer reports. Before then, the reports were used by DOCARE to verify the fisherman's commercial marine license when the catch was purchased. From 1990 until the fish dealer reports were data processed by the Fish Dealer Report System, which was implemented

in 1998, the reports were also used to verify significant catch data discrepancies on the fisherman's fishing report. The fish dealer reports have an important role in fisheries data collection. One of the severe limitation of fishing report data is the underreporting of total catch. Annual summary trends revealed that fish dealer purchases were larger than the ex-vessel landings reported on fishing reports. In October 2002, since the fishing report no longer collects ex-vessel landings, WPacFIN and DAR have been working on a data base application to integrate fish dealer transaction with fishing report records, and create a flat record file to report fish landing data by fishery. The fish dealer reports became the reliable data source to report landing trends in the commercial fisheries. Fishers who sold their catch at retail or on a cash basis such as peddling are also required to submit a dealer report. The following report forms were required of primary dealers and commercial fishers:

- **Commercial Marine Dealer's Report on Purchases of Marine Life** – completed by primary fish dealers (Appendix II.4a)
- **Personal Cash Sales Report** – completed by commercial fishers who sell their catch on cash basis; the report was implemented in October 2002 (Appendix II.4b)

### **Data Processing and Development of Fisheries Report Database Application Systems**

#### *Commercial Marine Fisheries Licenses and Permits*

From inception, commercial fishing licenses were issued manually. Copies of license records before 1988 are not available. Possibly, these records are stored in archives managed by the State Department of Accounting and General Services. DAR obtained copies of the license records from DOCARE, and began inputting it into annual DBASE data files from Fiscal 1988 through 1993. DAR also recorded the submission of fish reports received from fishers in annual logs from Fiscal 1977 through 1993.

Before assuming licensing duties from DOCARE in the late 1980s, DAR prepared a data processing budget plan to automate the issuance and tracking of fishing licenses, and logging the submission of fish reports collected from fishers. The development and implementation of the CMLS in July 1993 was a product of that plan. The CMLS began as a multi-user FoxPro DOS database application running on a LAN system attached to the main file server in the main DAR office. The system was networked to serve all of the DAR Island offices that issued licenses using PC workstations. In addition to automatically issuing new and renewing licenses, the system was used to enter the submission of monthly fishing reports into a report log database file.

Advancements in the MS operating system from DOS to Windows rendered the CMLS application, which was developed in DOS FoxPro into obsolescence. The

system could not adequately support external hardware such as printers. Therefore, the original CMLS had to be over hauled and DAR entered into a sole source contract with eHawaiiGov to develop a Web portal CMLS. Most of the operations and functions of the original CMLS were retained.

DAR implemented a licensing policy in March 2006 as an alternative to enforce the fish report requirement. The commercial marine license renewal was refused if the licensee did not comply with the fish report requirement. The CMLS on-line application was modified to accommodate this policy change. DAR experienced a slight improvement in the fish report submission rate, but it did not completely solve the non-compliance problem.

### *Commercial Fish Report*

It appears that about 40 years ago there was an initial mass production to data process historical fish reports from 1948 through 1970s into annual digital database files. Data documentation on how the reports were processed is non-existent. Computer file printouts and record layout formats suggest that the reports were key punched into computer cards and then copied onto magnetic tape for storage and retrieval. Apparently, data quality control procedures were not in place when these reports were processed, because there are severe data record limitations for this portion of the time series. The following data limitations are known:

- Missing values for license number, month, day, year, area fish, gear/method, species (for reported catches), and port
- Duplicate records
- Size weight for species is out of range
- Price for species is out of range
- Lbs. sold greater than lbs. caught
- Missing value for lbs. caught when lbs. sold and value are reported
- Missing value for lbs. sold when lbs. caught and value are reported
- Missing value for ex-vessel value when lbs. caught and lbs. sold are reported
- Ratio of lbs. sold over lbs. caught is too low
- Missing fish report record; a micro-fiche copy of the original fish report exists but there is no digitized fish report record

### *Historical Fish Report Record Modification*

To resolve this data limitation problem, WPacFIN recently provided technical support to develop a Visual FoxPro data base application to verify and validate the historical fish report annual files. The program created a flat record for each line of report data to capture the original and modified data fields, and a flag field indicator to describe the data limitations. Each record was validated for data discrepancies as outlined in the items listed above. Many discrepancies could be resolved in a practical manner without having to review the original fish report. Therefore, the application performed a global error check and automatically adjusted the marks into the appropriate modified data fields. For example, missing species, port and gear codes were assigned a miscellaneous code. Missing value was replaced by 3 standard deviations around the mean over a 3-year period (previous year, evaluation year, following year). DAR attempted to find and edit historical records with order of magnitude errors. This involved having to review the original fish report record and modifying the historical data record. DAR transmits updated historical fish report annual data files to WPacFIN. According to WPacFIN, the historical fish report data files are incorporated into the annual data files that they provide to the Stock Assessment group. The annual data file contains modifications or edits to the data fields. To complete verifying and validating the large volume of historical fish report records will take an indefinite amount of time. WPacFIN and DAR are considering a special data rescue project to use the micro-fiche and micro-film images and re-enter the reports under data processing control procedures for annual files that have too many data limitations. The duties and priorities of DAR's Statistical Unit are to process the current incoming fisheries reports.

### *Fish Report Data Processing and Quality Control Procedures*

From 1980s through 2002, fish report processing involved heavy editing and coding procedures. Report forms were edited by pasting over the original data columns strips of paper with 'corrections' posted in green ink. Species, method or gear and landing port data fields were coded in red ink. DAR used WANG hardware to key-in fish reports and submitted batch programs to the State Information Computer Services Division (ICSD), Department of Budget and Finance. ICSD compiled COBOL software programs on the State computer mainframe to input the batched data files and execute data quality control procedures to process the fish reports (Appendix II.4c). This procedure was too time consuming and was not conducive to process fisheries data on a fast-track basis. Annual fisheries data files were stored on ICSD mainframe drives. Batch programs must be compiled and submitted with appropriate job control language to process fishing reports or to retrieve data for analysis. After data processing was completed, the forms were eventually micro-fiched or micro-filmed in the 'edited version' for archival purposes, and the original report form was purged. From 1995 through September 2002, WPacFIN developed a FoxPro DOS PC database application called the Hawaii Commercial Marine Landing Report System (HCMLRS) to process the fishing reports. The data entry process was a

key-to-disk operation and it was outsourced to a contract vendor. The keypunch batch ascii text format data file was imported into the PC database application to run data quality control procedures.

From October 2002, when the new and revised commercial fishing report forms were implemented, this brought about broad sweeping changes to report processing functions for the fisheries reporting systems. Improvements were made to facilitate the handling, crediting of report submission, processing, and archiving of all report forms.

With technical support from WPacFIN, a Visual FoxPro database application was developed to document and index scanned images of reports for permanent storage into external hard disk drives. This application was called the Document Image Archival System (DIAS). On a daily basis, incoming fish and fish dealer reports were immediately scanned, and data entry of a document index to identify the report image to the fisher/dealer license number, month and year of report, report type, type of report (did not fish/did not purchase or activity/purchase), and receive date was processed. A script routine was encoded into the DIAS workstation CPU to execute a daily file transfer protocol (FTP) at 12:00 AM to send the fisheries report document index to the Web portal CMLS vendor to update the commercial marine licensee and dealer report logs. In turn, the Web portal CMLS vendor executed a scripted FTP at 2:00 AM to transmit an updated extract copy of the commercial marine license relational database file to DAR's file server.

WPacFIN also developed a new multi-user Visual FoxPro database PC application to process the new and revised fishing reports. Further refinements were made to enhance data quality control procedures. The manual and editing and coding routines that covered and changed the marks on the original report forms were discontinued. Data entry was made directly from the fish report. Edits were made onto a copy of the original report form and after data processing, it was scanned and document indexed in the DIAS. Upon implementing the revised reports, an information and education campaign was launched by providing fishers with VHS tapes and DVDs on information about the fisheries and instructions to complete the report forms. Fishing method and species names were standardized. Some gears or methods were obsolete or were often incorrectly reported by fishers. A list of gears with definitions was included in the fishing report booklet. Fishers often reported species using ethnic, market, local names and generic names. A concerted effort was made to encourage fishers to report specific species names such as 'yellowfin tuna' or 'bigeye tuna' or striped marlin', etc., instead of generic names such as 'ahi', 'marlin', and 'ulua'. A list of species with the appropriate name in boldface type for reporting purposes was included in the fish report booklet. By standardizing information, a consistent and reliable data collection is attained as to what is caught, sold, reported, processed, and analyzed.

### *Temporary Federal Data Processing Support Unit*

Because of the Magnuson Stevenson Fisheries Reauthorization Act that uses a new federal control rule on total annual catch (TAC) to manage fisheries in overfishing conditions, it became necessary to process the fisheries reports on an accelerated fast-track basis for the MHI bottomfish fishery. The existing DAR Statistical Unit staff was unable to meet this requirement. Before the MHI bottomfish fishery re-opened last October 2007, a temporary data processing unit was contracted by PIFSC to assist DAR. One data assistant was assigned to fish report processing, and another to fish dealer reports. The third staff was the data processing coordinator. At the start of the fishing season, fishers and dealers were contacted about requesting their cooperation to submit reports at the end of a trip or on a weekly basis. Based on dealer reports, which are usually submitted earlier than the fisher's fish reports, the unit could determine the fishers who landed bottomfish during a month. At the beginning of each month, both fishers and dealers were contacted to remind them of the report requirement. This was followed up with a letter notifying them of a set deadline to comply. Fishers and dealers who did not comply with the report requirement were immediately referred to DOCARE. The same procedure was applied to those who submitted reports with incomplete or incorrect information. All fisheries data processed by the Statistical Unit and the temporary federal support unit were transmitted to WPacFIN via FTP on a daily basis. Through the effort of this unit, the reporting compliance and data collection for this fishery produced dramatic results. The fish report non-submission rate was well below that of other fisheries, and just about all of the fish dealers submitted their monthly reports. NOAA fisheries were able to track the cumulative landings for the MHI bottomfish fishery on a near real-time basis and could effectively monitor the TAC.

### *Fish Dealer Report Data Processing and Quality Control Procedures*

Beginning in 1998, the fish dealer reporting system (FDRS) was implemented. WPacFIN developed a visual FoxPro PC database application to process commercial primary marine dealer reports. The FDRS was designed to:

- Receive and process electronic report data files from dealers. Fish dealers with data processing or computer capabilities transmitted their purchase transaction data onto spreadsheets or extract files exported from computer accounting systems
- Import electronic data files into the database application to run data quality control procedures
- Key-in purchase transaction records from paper dealer reports and run data quality control procedures

- Generate discrepancy report than can be sent to dealers via e-mail or snail mail for verification
- Process separate annual fish dealer report database files for aquarium and non-aquarium dealers
- Export an annual database file, aquarium or non-aquarium for analysis
- Store and retrieve annual database files for dealer reports since 1998

Currently, there are approximately 250 active primary dealers, of which, 48 submit electronic files including the State's only fish auction, and all of the major wholesalers who handle high volume purchase transactions.

The basic data processing routine consists of downloading electronic dealer report files from the DLNR supported Lotus Notes e-mail service on a daily basis. A copy of the original electronic file is saved on the workstation hard drive. The file is imported into the FDRS application where program functions are run to verify the validity of the data before it is saved to a master annual database file. Purchase transaction report discrepancies are either e-mailed or printed and then sent via snail mail to the dealer for verification and corrections. Paper dealer reports are keyed-in directly into the FDRS and the data control procedures are identical to the electronic version.

The fish dealer report processing workload is shared among several workers. A fish dealer clerk in the PIFSC office is in charge of processing fish dealer files for the United Fishing Agency, Hilo Fish Company, and Kona Fish Company; overseeing final verification of the master fish dealer report database file; and finding and adding new primary fish dealers. A DAR Office Assistant handles the data processing for all other fish dealer reports. A temporary federal data assistant contract worker shares this assignment by processing dealer reports with bottomfish landings.

# Appendix II.1 Commercial Marine License Application

PLS-1 (REV. 7/1985)

State of Hawaii  
DEPARTMENT OF LAND AND NATURAL RESOURCES

LICENSE NO. 86-

- RENEWAL     INDIV DUAL  
 NEW         VESSEL  
 MAIL         VESSEL ADMENDMENT

## COMMERCIAL MARINE LICENSE 1985-1986

LICENSE FEE  
 RESIDENT \_\_\_\_\_ x \$25 = \_\_\_\_\_  
 NON-RESIDENT \_\_\_\_\_ x \$50 = \_\_\_\_\_  
 GRAND TOTAL \_\_\_\_\_

Effective: Date of Issue to June 30, 1986

Name (Last, First, Middle Initial)		Sex M <input type="checkbox"/> F <input type="checkbox"/>	Birth Date	Weight	Height	Color of Hair	Color of Eyes
Mailing Address		City	County/State		Zip		
Residence Street No. & Name		City	County/State		Zip		
Birth Place	Length of Residence in Hawaii	U.S. Citizen? <input type="checkbox"/> Yes <input type="checkbox"/> No	Business Phone	Home Phone		<input type="checkbox"/> PART-TIME COMMERCIAL <input type="checkbox"/> FULL-TIME COMMERCIAL**	
CHECK: <input type="checkbox"/> CREW MEMBER <input type="checkbox"/> BOAT CAPTAIN <input type="checkbox"/> CHARTER <input type="checkbox"/> SHORELINE FISHERMAN		Name of Boat: _____ _____ Name of Boat: _____ HA. No.: _____ Documented No.: _____ Number of Crew: _____ Port of Anchorage: _____		METHOD OF FISHING (Rank in order of Usage. No more than 3) _____ Deepsea HL (opapepaka, onaga, etu) _____ Trolling _____ Nets Specify (gill, throw, trawl, purse, surround, etc.) _____ Traps (pot) _____ Ika-shibi/Palu-ahi _____ Inshore HL (akule, opelu, moana) _____ Spear _____ Hand-pick (limu, ophi, etc.) _____ Other (specify) _____ Aquarium (C-6) _____ Fish Pond (Pond) _____ Pole & Line (Aku boats) (C-4) _____ Longline (taglina, ahi boats) (C-5) _____ Other Longline (kaka line, set line)		AREA FISHED <input type="checkbox"/> HI <input type="checkbox"/> NWHI <input type="checkbox"/> Other Specify _____ X _____ SIGNATURE OF LICENSEE If Minor below age 18 _____ PARENT OR GUARDIAN	
Monthly Fish Catch Report Required? <input type="checkbox"/> Yes <input type="checkbox"/> No						<b>VALIDATION (LAND AND NATURAL RESOURCES USE ONLY)</b>  AGENT _____ DATE _____ ISLAND _____	

\*ANY PERSON WHO HAS RESIDED IN THE STATE FOR ONE YEAR OR LONGER (HAWAII REVISED STATUTES § 189-2)  
 \*\*ANY PERSON WHO DERIVES MORE THAN ONE-HALF OF HIS GROSS ANNUAL INCOME FROM FISHING.

\*\*ORIGINAL TO LICENSEE\*\*

















## Appendix II.3e Net, Trap and Dive Activity Report Form

FOR OFFICE USE  
 R/L \_\_\_\_\_  
 K/D \_\_\_\_\_

Please Print Net, Trap, & Dive Activity Report

**HEADER**

Licensee Name \_\_\_\_\_ Commercial Marine License No.         

Vessel Name \_\_\_\_\_ HA No.          -      USCG No.             

Port of Landing \_\_\_\_\_

**FISHING EFFORT**

Date Fished      /      /       

Fishing Method Used \_\_\_\_\_  
(One method per form)

Net Dimensions in Feet \_\_\_\_\_ X \_\_\_\_\_  
Length Height

No. of Net Sets or Throws \_\_\_\_\_  
(Number of lines)

No. of Traps, Crab Nets \_\_\_\_\_  
(Traps or Crab Nets harvested)

No. of Divers \_\_\_\_\_  
(Methods SS or DV)

Area Fished \_\_\_\_\_  
(One area per form)

Hours Fished \_\_\_\_\_  
(Soak Time)

No catch "X"  (Enter an X if you did not catch anything)

**FISH CATCH**

Species Name	No. Landed	Lbs. Landed	Number Lost	Number Released
<i>Scad</i>				
Akule (89ygs)	(28)			
Opelu (90ygs)	(81)			
<i>Goat Fish</i>				
Kumu (91ygs)	(52)			
Moana (92ygs)	(68)			
Moana kali (93ygs)	(206)			
Red weke (94ygs)	(127)			
Weke nono (95ygs)	(24)			
White weke (96ygs)	(128)			
<i>Unicorn &amp; Surgeon Fish</i>				
Kala (97ygs)	(47)			
Umaumalei (98ygs)	(125)			
Kole (99ygs)	(51)			
Maiko (100ygs)	(60)			
Manini (101ygs)	(64)			
Naenae (102ygs)	(72)			
Palani (103ygs)	(86)			
Pualu (104ygs)	(92)			
<i>Other Species</i>				
Aawa (105ygs)	(25)			
Aholehole (106ygs)	(27)			
Awsoweo (107ygs)	(34)			
Menpachi (108ygs)	(100)			
Mu (109ygs)	(71)			
Nanue (110ygs)	(74)			
Taape (111ygs)	(114)			
Toau (112ygs)	(115)			
Uhu (113ygs)	(96)			
<i>OTHER SPECIES (Use Species List)</i>				

**INVERTEBRATE CATCH**

Species Name	No. Landed	Lbs. Landed	No. Released	Minimum Size	No. Lost
Red Spiny Lobster (716)					
Green Spiny Lobster (717)					
Huani (718)					
Squamosus (719)					
Kona Crab (701)					
White Crab (702)					
Laevigatus (703)					
Ensisfer (704)					
Ho o (705)					
<i>OTHER SPECIES (Use Species List)</i>					

Number Lost to Predators: SHARKS \_\_\_\_\_ UNKNOWN \_\_\_\_\_ OTHER \_\_\_\_\_

Comments to DAR: \_\_\_\_\_

Division of Aquatic Resources, Department of Land and Natural Resources, State of Hawaii  
NTDAR 5/2004

SEND THIS COPY

Page \_\_\_\_\_ of \_\_\_\_\_





## Appendix II.3h Bottomfish Trip Sales Report Form

State of Hawaii  
Department of Land and Natural Resources  
Division of Aquatic Resources

**BOTTOMFISH TRIP SALES REPORT**

Licensee \_\_\_\_\_ Commercial Marine License No. \_\_\_\_\_

Federal No. \_\_\_\_\_ (A) HA No. H/A - \_\_\_\_\_ - \_\_\_\_\_

Month \_\_\_\_\_ Year 19 \_\_\_\_\_ Vessel \_\_\_\_\_

Trip Start Date \_\_\_\_/\_\_\_\_/\_\_\_\_ Trip End Date \_\_\_\_/\_\_\_\_/\_\_\_\_  Place an "X" in the box if you did not fish

Part of Landing \_\_\_\_\_

Species Caught	No. Sold	Lbs. Sold	Value of lbs. Sold	To Whom Sold
<b>SNAPPER:</b>				
Blue	21			
Gladiol	97			
Kakula	17			
Loli	58			
Onaga	79			
Opokopaka	19			
Uka	20			
<b>JACKS:</b>				
Black Uluu, Ozukan	202			
Butagochi	200			
Dobe Uluu	201			
Kapami Uluu	104			
Omiu	18			
Papa Uluu	704			
Menpaahi Uluu, Sasa	203			
White Uluu	205			
<b>OTHER:</b>				
Hayamau (Seabass)	13			
Hogo	300			
Kabala	30			
Wete Ulu	24			
Aweo	23			
Aweo	34			

Species Caught	No. Sold	Lbs. Sold	Value of lbs. Sold	To Whom Sold
Ono	14			
Mahimahi	13			
Ahi (Yellow Fin)	5			
Kawakawa	7			
Shark (specify)				
Other (specify)				

The above report is true, correct, and complete to the best of my knowledge and belief.

Signature \_\_\_\_\_ Licensee or authorized agent

FOR OFFICER USE

REC'D _____
LOGGED _____
E/C _____
SUBMIT _____

NWSAL (Rev. 1/96)





**Appendix II.4a**  
**Fish Report Data Record File Format**

Filename: **CYyyyy.dbf**

Usage: Combined FRS catch data - includes historical records (modified)

<u>Field name</u>	<u>Type</u>	<u>Len./Dec.</u>	<u>Description</u>
<b>LICENSE</b>	Num.	6	Fisherman's commercial marine license number
<b>TRIP_END</b>	Date	8	Last day of fishing trip
<b>FISHED</b>	Date	8	Fishing day
<b>BUOY</b>	Char.	2	Buoy code
<b>AREA</b>	Num.	5	Area fished code - DAR area chart
<b>SUBAREA</b>	Char.	1	Sub-area fished code -DAR area chart
<b>GEAR</b>	Num.	2	Gear or fishing method code
<b>SETS</b>	Num.	3	Number of sets (for specific net type)
<b>HOURS</b>	Num.	7	Number of hours fished
<b>NO_GEAR</b>	Num.	5	Number of gear units
<b>HOOKS</b>	Num.	5	Number of hooks per line
<b>NET_LENGTH</b>	Num.	5	Net length in feet
<b>NET_HEIGHT</b>	Num.	5	Net height in feet
<b>BANK</b>	Char.	18	Name of bank fished (DAR area chart)
<b>BANK_QUAD</b>	Char.	2	Quadrant direction of bank fished, i.e. SW, NW, etc.
<b>DEPTH_BEG</b>	Num.	3	Beginning depth (fathom) – deep handline gear
<b>DEPTH_END</b>	Num.	3	Ending depth (fathom) – deep handline gear
<b>WIND_SPEED</b>	Num.	2	Wind speed (MPH)
<b>WIND_DIR</b>	Char.	2	Wind direction (S, SE, SW, etc.)
<b>WAVE_HT</b>	Num.	2	Wave height in feet
<b>CUR_SPEED</b>	Char.	1	Water/ocean/sea current speed (slow, fast)

<u>Field name</u>	<u>Type</u>	<u>Len./Dec.</u>	<u>Description</u>
<b>CUR_DIR</b>	Char.	2	Water/ocean/sea current direction
<b>NOCATCH</b>	Logic	1	Flag for 'did not catch' effort
<b>PORT_LAND</b>	Num.	3	Port of landing code
<b>LOGBOOK</b>	Num.	6	Logbook number (NWHI Bottomfish Daily Log)
<b>NUM_STOLEN</b>	Num.	5	Number of pieces stolen
<b>CREW</b>	Num.	3	Number of crew
<b>CHARTERED</b>	Logic	1	Flag for chartered trips
<b>R_MONTH</b>	Num.	2	Report month
<b>R_YEAR</b>	Num.	4	Report year
<b>FORMTYPE</b>	Char.	8	Fishing report form type
<b>TIMELINK</b>	Date	8	System time stamp when report was first keyed-in
<b>F_AREA</b>	Logic	1	Flag for invalid area
<b>F_BUOY</b>	Logic	1	Flag for invalid buoy
<b>F_GEAR</b>	Logic	1	Flag for invalid gear
<b>F_AR_GR</b>	Logic	1	Flag for invalid area/gear combination
<b>F_BY_PR</b>	Logic	1	Flag for invalid buoy/port of landing combination
<b>LNAME</b>	Char.	24	Licensee last name
<b>FNAME</b>	Char.	18	Licensee first name
<b>VESSEL</b>	Char.	20	Vessel name
<b>USCG</b>	Char.	7	U.S. Coast Guard vessel documentation number
<b>HA_NO</b>	Char.	8	State vessel registration number
<b>PORT_LAND2</b>	Num.	3	Secondary port – value copied to PORT_LAND
<b>PORT_DPRTR</b>	Num.	3	Port of departure
<b>TRIP_BEG</b>	Date	8	First day of fishing trip
<b>SYSDATE</b>	Date	8	System time stamp when record was last updated

<u>Field name</u>	<u>Type</u>	<u>Len./Dec.</u>	<u>Description</u>
<b>SPECIES</b>	Num.	3	Species code
<b>CAUGHT</b>	Num.	5	Number of pieces caught or kept
<b>LBS</b>	Num.	8	Pounds caught or kept
<b>NUM_SOLD</b>	Num.	8	Number of pieces sold
<b>LBS_SOLD</b>	Num.	8.2	Pounds sold
<b>VALUE</b>	Num.	10.2	Value of pounds sold
<b>BUYER</b>	Char.	30	Primary dealer who purchased the catch
<b>LOST</b>	Num.	5	Number of pieces lost
<b>RELEASE</b>	Num.	5	Number of pieces that were release
<b>REL_ALIVE</b>	Num.	5	Number of pieces that were release alive
<b>REL_DEAD</b>	Num.	5	Number of pieces that were release dead
<b>DAMAGE</b>	Num.	5	Number of pieces that are damage
<b>F_SPEC_GR</b>	Logic	1	Flag for invalid species/gear combination
<b>F_SPEC_AR</b>	Logic	1	Flag for invalid species/area combination
<b>F_SEASON</b>	Logic	1	Flag for species caught during closed season
<b>F_PIECES</b>	Logic	1	Flag for invalid pieces - include flag for invalid lbs
<b>F_LBS</b>	Logic	1	Flag for invalid lbs. - include flag for invalid pieces
<b>F_CTCHLIM</b>	Logic	1	Flag for exceeding catch limit for the species





Content: Refer to Appendix II4.d and II4.e for a list of fishing method codes and definitions.

Field: **SETS** Type: Numeric Length: 3  
Description: The number of times certain nets or traps are set during a fishing activity. Net types include seine, lobster, throw, bait, and purse seine. Trap type include crab trap. This data field is available since October 2002, and is collected from the new Net, Trap, Dive Activity and revised Fishing Report forms.

Field: **HOURS** Type: Numeric Length: 7.2  
Description: This is the total number of hours fished in a fishing activity using a specific gear or method for an area fished. Hours fished does not include transit time (non-fishing activity) between fishing areas, or from fishing areas and ports of departure or arrival. This data field is available from the fishing effort section of the Federal NWHI Bottomfish Trip Daily log report form since 1995. It is also available since October 2002, from the fishing effort section of the new and revised fishing report forms.

Field: **NO\_GEARs** Type: Numeric Length: 5  
Description: This is the total number of units of gears used in a fishing activity. For example, number of gears for a deep-sea handline activity is measured in terms of number of lines used. This data field is available from the fishing effort section of the Federal NWHI Bottomfish Trip Daily log report form since 1995. It is also available since October 2002, from the fishing effort section of the new and revised fishing report forms.

Field: **HOOKS** Type: Numeric Length: 5  
Description: This is the number of hooks per line used in a bottomfishing activity for an area fished. If more than one line is used at one time, the average number of hooks per line is reported. This data field is available from the fishing effort section of the Federal NWHI Bottomfish Trip Daily log report form since 1995. It is also available since October 2002, from the fishing effort section of the new Deep-sea Handline Trip report form.

Field: **NET LENGTH** Type: Numeric Length: 5  
Description: This is the length in feet of gill and shrimp trawl nets. This data field is available from the fishing effort section of the Fishing Report form and is processed and stored in the "NO\_GEARs" field. It is also available from the Net, Trap & Dive Activity Report form.

Field: **NET HEIGHT** Type: Numeric Length: 5.2  
Description: This is the height in feet of gill and shrimp trawl nets. This data field is available from the Net, Trap & Dive Activity Report form.

Field: **BANK** Type: Alphanumeric Length: 18  
Description: This is the name of a bank, shoal, reef, pinnacle, atoll, island, or seamount where fishing activity occurred. This data field is from the header section of the Federal NWHI Bottomfish Trip Daily log report form.

Field: **BANK\_QUAD** Type: Alphanumeric Length: 2  
Description: This is the directional quadrant, NE, NW, SW or SE of the bank fished. This data field is from the header section of the Federal NWHI Bottomfish Trip Daily log report form.

Field: **DEPTH\_BEG** Type: Numeric Length: 3  
Description: This is the approximate depth range in fathoms where the bottomfishing activity began. This data field is from the fishing effort section of the Federal NWHI Bottomfish Trip Daily log report form.

Field: **DEPTH\_END** Type: Numeric Length: 3  
Description: This is the approximate depth range in fathoms where the bottomfishing activity ended. This data field is from the fishing effort section of the Federal NWHI Bottomfish Trip Daily log report form.

Field: **WIND\_SPEED** Type: Numeric Length: 2  
Description: This is the estimated wind speed in knots from which the wind is blowing at the beginning of the bottomfishing activity. This data field is from the fishing effort section of the Federal NWHI Bottomfish Trip Daily log report form.

Field: **WIND\_DIR** Type: Alphanumeric Length: 2  
Description: This is the direction of the wind from which it is blowing at the beginning of the bottomfishing activity, and is from the Federal NWHI Bottomfish Trip Daily log report form.

Field: **WAVE\_HT** Type: Numeric Length: 2  
Description: This is the estimated wave height in feet at the beginning of a bottomfishing activity, and is from the fishing effort section of the Federal NWHI Bottomfish Trip Daily log report form.

Field: **CUR\_SPEED** Type: Alphanumeric Length: 1  
Description: This is the approximate sub-surface current speed in terms of slow, medium or fast for that day's bottomfishing activity. This data field is from the fishing effort section of the Federal NWHI Bottomfish Trip Daily log report form.

Field: **CUR\_DIR** Type: Alphanumeric Length: 2  
Description: This is the direction of the sub-surface current traveling for that day's bottomfishing activity. This data field is from the fishing effort section of the Federal NWHI Bottomfish Trip Daily log report form.

Field: **NOCATCH** Type: Logical Length: 1  
Description: This is a flag field to indicate that nothing was caught during a fishing trip.

Field: **PORT\_LAND** Type: Numeric Length: 3  
Description: This is the port or location where the catch was landed. Refer to Appendix C for listing of landing port names by code.

Field: **LOGBOOK** Type: Numeric Length: 6  
Description: This is the sequential page number of the report form from the NWHI Bottomfish Trip Daily Log Report.

Field: **NUM\_STOLEN** Type: Numeric Length: 5  
Description: This is the total estimated number of unidentified bottomfish stolen by predators before it is landed. This data field is from the Federal NWHI Bottomfish Trip Daily log report form and is processed as part of the fishing effort information.

Field: **CREW** Type: Numeric Length: 3  
Description: This is the number of crew on board the aku boat or live-bait tuna boat. This data field is available from the fishing effort section of the Aku Boat Fishing Report form.

Field: **CHARTERED** Type: Logical Length: 1  
Description: This is a flag field to indicate that a fishing trip was chartered. This data field is available from the fishing effort section of the Fishing Report form.

Field: **R\_MONTH** Type: Numeric Length: 2  
Description: Fishing report month. For report types that collect daily fishing trip information, this information is determined by date fished. Otherwise, this information is determined by trip end date information from multi-day trip type reports, e.g. longline trip report.

Field: **R\_YEAR** Type: Numeric Length: 4  
Description: Fishing report year. For report types that collect daily fishing trip information, this information is determined by date fished. Otherwise, this information is determined by trip end date information from multi-day trip type reports, e.g. longline trip report.

Field: **FORMTYPE** Type: Alphanumeric Length: 8  
Description: This is the new fishing report form type, e.g. Aku Boat Fishing Report, Longline Trip Report, Fishing Report, etc. This field is available since October 2002 when the new and revised fish report forms were implemented.  
Content:

<u>Code</u>	<u>Report form</u>
<b>AKU</b>	Aku Boat Fishing Report

<b>DEEP</b>	Deep-sea Handling Trip Report
<b>TUNA</b>	Tuna Handline Trip Report
<b>NET</b>	Net, Trap, Dive Activity Report
<b>BAIT</b>	Bait Report
<b>MONTHLY</b>	Fishing Report
<b>AQUARIUM</b>	Aquarium Report

Field: **TIMELINK** Type: DateTime Length: 8  
 Description: This is a date time stamp that indicates when the Fishing Report System (FRS) originally entered a record for processing. This information is available from October 2002 when the FRS was implemented to process the new and revised fishing report forms.

Field: **F\_AREA** Type: Logical Length: 1  
 Description: This is a flag field to indicate that there is a discrepancy in the area fish code. The information could not be corrected through post-data validation procedures.

Field: **F\_BUOY** Type: Logical Length: 1  
 Description: This is a flag field to indicate that there is a discrepancy in the fish aggregating device code. The information could not be corrected through post-data validation procedures.

Field: **F\_GEAR** Type: Logical Length: 1  
 Description: This is a flag field to indicate that there is a discrepancy in the gear or fishing method code. The information could not be corrected through post-data validation procedures.

Field: **F\_AR\_GR** Type: Logical Length: 1  
 Description: This is a flag field to indicate that there may be a discrepancy involving the type of gear or fishing method used in the area fished. The information could not be corrected through post-data validation procedures.

Field: **F\_BY\_PR** Type: Logical Length: 1  
 Description: This is a flag field to indicate that there may be a discrepancy involving the reported fish aggregating device and the port where the catch or fishing vessel was landed. The information could not be corrected through post-data validation procedures.

Field: **LNAME** Type: Alphanumeric Length: 24  
 Description: This is the last name of the licensed commercial fisherman. It is available since October 2002, from the fishing effort section of the report form.

Field: **FNAME** Type: Alphanumeric Length: 18  
 Description: This is the first name of the licensed commercial fisherman. It is available since October 2002, from the fishing effort section of the report form.

Field: **VESSEL** Type: Alphanumeric Length: 20  
Description: This is the name of the fishing vessel used by a licensed fisherman. Fishing vessel name was processed beginning with the July 1995 fish reports. This field was not validated because changes to vessel name or fishing trips by new vessels could not be reliably verified through updated state vessel registration files and tracked through the commercial marine license record files.

Field: **USCG** Type: Alphanumeric Length: 7  
Description: This is the vessel documentation number assigned by the U.S. Coast Guard for large fishing vessels (usually over 4 net tons) used by licensed fishermen. The Vessel Document number was processed beginning with the July 1995 fishing reports. This field was not validated because changes to vessel documentation could not be reliably verified through updated USCG vessel documentation files and tracked through the commercial marine license record files.

Field: **HA\_NO** Type: Alphanumeric Length: 8  
Description: This is the state vessel registration number issued by Division of Boating and Ocean Recreation, DLNR for fishing vessels used by licensed fishermen. Vessel registration was processed beginning with the July 1995 fishing reports. This field was not validated because changes to vessel registration could not be reliably verified through updated state vessel registration files and tracked through the commercial marine license record files.

Content:

<u>Vessel Use Designation (suffix)</u>	<u>Description</u>
<b>A, B, C, D, E, F</b>	Recreational usage designation
<b>CF</b>	Commercial fishing
<b>CP</b>	Commercial passenger

Field: **PORT\_LAND2** Type: Numeric Length: 3  
Description: This is the numerical code for a port where a tuna handline fishing vessel landed its catch. This data field is available from the head section of the Tuna Handline Fishing Trip Report. The ports of departure and landing for highline tuna handline fishing vessels may differ depending on fishing area and market landing strategy.  
Content: Refer to Appendix II.4h through II.4m for a list of landing port names by code.

Field: **PORT\_DPRTR** Type: Numeric Length: 3  
Description: This is the numerical code for a port from which a tuna handline fishing vessel departed. This data field is available from the head section of the Tuna Handline Fishing Trip Report. The ports of departure and landing for highline tuna handline fishing vessels may differ depending on fishing area and market landing strategy.  
Content: Refer to Appendix II.4h through II.4m for a list of departure port names by code.

Field: **TRIP\_BEG** Type: Date Length: 8  
Description: This is the fishing trip start date, which is usually the departure date. This information is from multi-day fishing trip report forms, e.g. longline trip report.

Field: **SYSDATE** Type: Date Length: 8  
Description: This is the system date when the record was last modified.

Field: **SPECIES** Type: Numeric Length: 3  
Description: This is the numeric code of the species caught or landed. Species are identified by common name or local, market and ethnic names. Species are uniquely identified by their scientific family and genus names.  
Content: Refer to Appendix II.4g for listing of species names by code.

Field: **CAUGHT** Type: Numeric Length: 5  
Description: Total number of fish caught or landed. For species caught in large quantities, such as akule, opelu, or menpachi, the piece count is usually reported as an estimate or left blank. For records derived from the NWHI Bottomfish Trip Daily Log, number of fish caught and kept is an adjusted number created artificially through a data integration algorithm to match fish caught for the trip by species with fish sold from the NWHI Bottomfish Trip Sales report. Discrepancies where number sold (sales) exceeds number pieces reported caught (log) results in adjustment for number caught. In this case, the number caught figure is replaced with number sold.

Field: **LBS** Type: Numeric Length: 8.1  
Description: Total estimated weight of fish caught or landed. For records derived from the NWHI Bottomfish Trip Daily Log, pounds caught is an adjusted number created artificially through a data integration algorithm to match pounds caught for the trip by species with fish sold from the NWHI Bottomfish Trip Sales report. Discrepancies where pounds sold (sales) exceed reported pounds caught (log) results in adjustment for pounds caught. In this case, the pounds caught figure is replaced with pounds sold.

Field: **NUM\_SOLD** Type: Numeric Length: 5  
Description: This is the total number of fish sold and it is collected from the NWHI Bottomfish Trip Sales report form.

Field: **LBS\_SOLD** Type: Numeric Length: 8  
Description: Total weight of fish sold. Except for the Northwestern Hawaiian Islands Daily Log report, pounds sold data are available only from 1948 through September 2002.

Field: **VALUE** Type: Numeric Length: 10.2  
Description: Total value of pounds sold. This is the ex-vessel value or amount sold to a primary fish dealer. Except for the Northwestern Hawaiian Islands Daily Log report, value is available only from 1948 through September 2002.

Field: **BUYER** Type: Alphanumeric Length: 30  
Description: This is the business name of a primary fish dealer who bought fish directly from fisher. Information for this data field is available from 1995 through September 2002.

Field: **LOST** Type: Numeric Length: 5  
Description: This is the number of fish lost due to predators such as sharks, porpoises, etc. The number lost due to predation is mutually exclusive of the number of reported pieces caught or landed. This data field is available from the catch section of the new and revised fishing report forms implemented on October 2002.

Field: **RELEASE** Type: Numeric Length: 5  
Description: This is the total number of fish released dead or alive at sea. The number released is mutually exclusive of the number of reported pieces caught or landed. This data field is available from the catch sections of the Federal NWHI Bottomfish Trip Daily log report form since 1995, and from the new and revised fishing report forms implemented on October 2002.

Field: **REL\_ALIVE** Type: Numeric Length: 5  
Description: This is the number of marine life released alive at sea. The number released alive is mutually exclusive of the number of reported pieces caught or landed. This data field is available from the catch section of the Federal NWHI Bottomfish Trip Daily log report form.

Field: **REL\_DEAD** Type: Numeric Length: 5  
Description: This is the number of marine life released dead at sea. The number released dead are mutually exclusive of the number of reported pieces caught or landed. This data field is available from the catch section of the Federal NWHI Bottomfish Trip Daily log report form.

Field: **DAMAGE** Type: Numeric Length: 5  
Description: This is the number of fish damaged by predators regardless if it was kept or released. This data field is only available from the catch section of the Federal NWHI Bottomfish Trip Daily log report form.

Field: **F\_SPEC\_GR** Type: Logical Length: 1  
Description: This is a flag field to indicate that there may be a discrepancy involving the type of species caught by the gear or fishing method used. The information could not be corrected through post-data validation procedures.

Field: **F\_SPEC\_AR** Type: Logical Length: 1  
Description: This is a flag field to indicate that there may be a discrepancy involving the type of species caught in the area fished. The information could not be corrected through post-data validation procedures.

Field: **F\_SEASON** Type: Logical Length: 1  
Description: This is a flag field to indicate that there may be a discrepancy involving regulated species caught during closed season. The reporting of species caught during closed season is not necessarily a data validation error; it may have been by-catch and released. The information could not be corrected through post-data validation procedures.

Field: **F\_PIECES** Type: Logical Length: 1  
Description: This is a flag field to indicate that there may be a discrepancy in the number of pieces caught or landed. The information could not be corrected through post-data validation procedures.

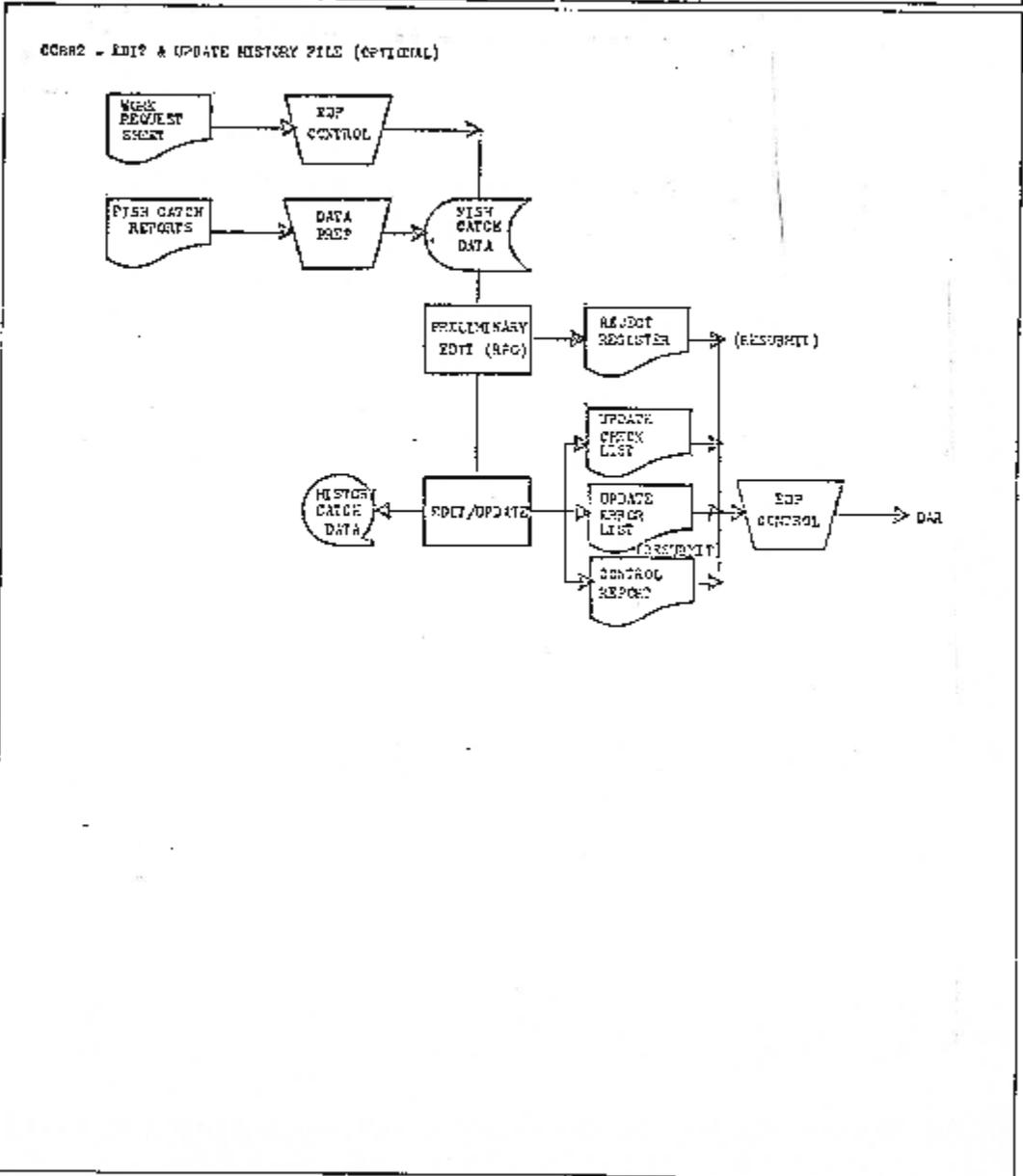
Field: **F\_LBS** Type: Logical Length: 1  
Description: This is a flag field to indicate that there may be a discrepancy in pounds caught or landed. The information could not be corrected through post-data validation procedures.

Field: **F\_CTCHLIM** Type: Logical Length: 1  
Description: This is a flag field to indicate that there may be a discrepancy involving the fishing quota or bag limit of a regulated species. The reported number of pieces caught exceeding the species bag limit is not necessarily a data validation error; it may have been by-catch and subsequently released. The information could not be corrected through post-data validation procedures.

## Appendix II.4c Fish Catch Report Computer Batch Data Processing Documents

		<p><b>SDM/70</b></p> <p>GENERAL DOCUMENTATION FORM</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">PROJECT NUMBER</td> <td style="width: 50%;"></td> </tr> <tr> <td>DATE</td> <td style="text-align: center;">REV</td> </tr> <tr> <td>PAGE</td> <td style="text-align: center;">3 of 3</td> </tr> </table>	PROJECT NUMBER		DATE	REV	PAGE	3 of 3
PROJECT NUMBER									
DATE	REV								
PAGE	3 of 3								

PHASE	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;">SYSTEM TITLE</td> <td>COMMERCIAL FISHERIES INFORMATION SYSTEM</td> </tr> <tr> <td>TASK NUMBER</td> <td>COMMERCIAL FISH CATCH DATA SYSTEM</td> </tr> </table>	SYSTEM TITLE	COMMERCIAL FISHERIES INFORMATION SYSTEM	TASK NUMBER	COMMERCIAL FISH CATCH DATA SYSTEM	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">DOCUMENT PART</td> <td style="width: 50%;"></td> </tr> <tr> <td>DOCUMENT SECTION</td> <td>APPENDIX C</td> </tr> </table>	DOCUMENT PART		DOCUMENT SECTION	APPENDIX C
SYSTEM TITLE	COMMERCIAL FISHERIES INFORMATION SYSTEM									
TASK NUMBER	COMMERCIAL FISH CATCH DATA SYSTEM									
DOCUMENT PART										
DOCUMENT SECTION	APPENDIX C									



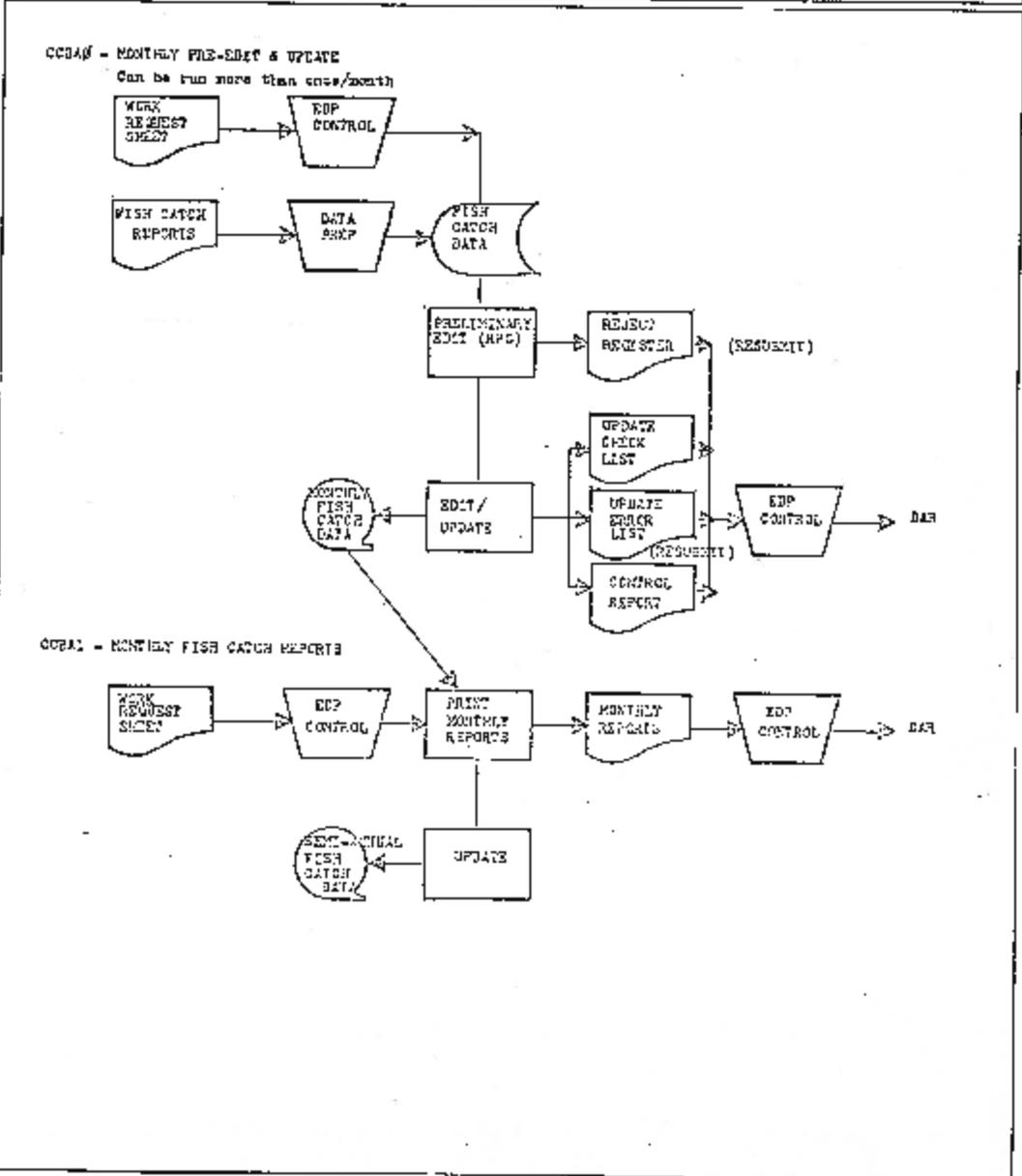
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GENERAL  
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PHASE	SYSTEM TITLE COMMERCIAL FISHERIES INFORMATION SYSTEM	DOCUMENT PART
TASK NUMBER	COMMERCIAL FISH CATCH DATA SYSTEM	DOCUMENT SECTION APPENDIX C



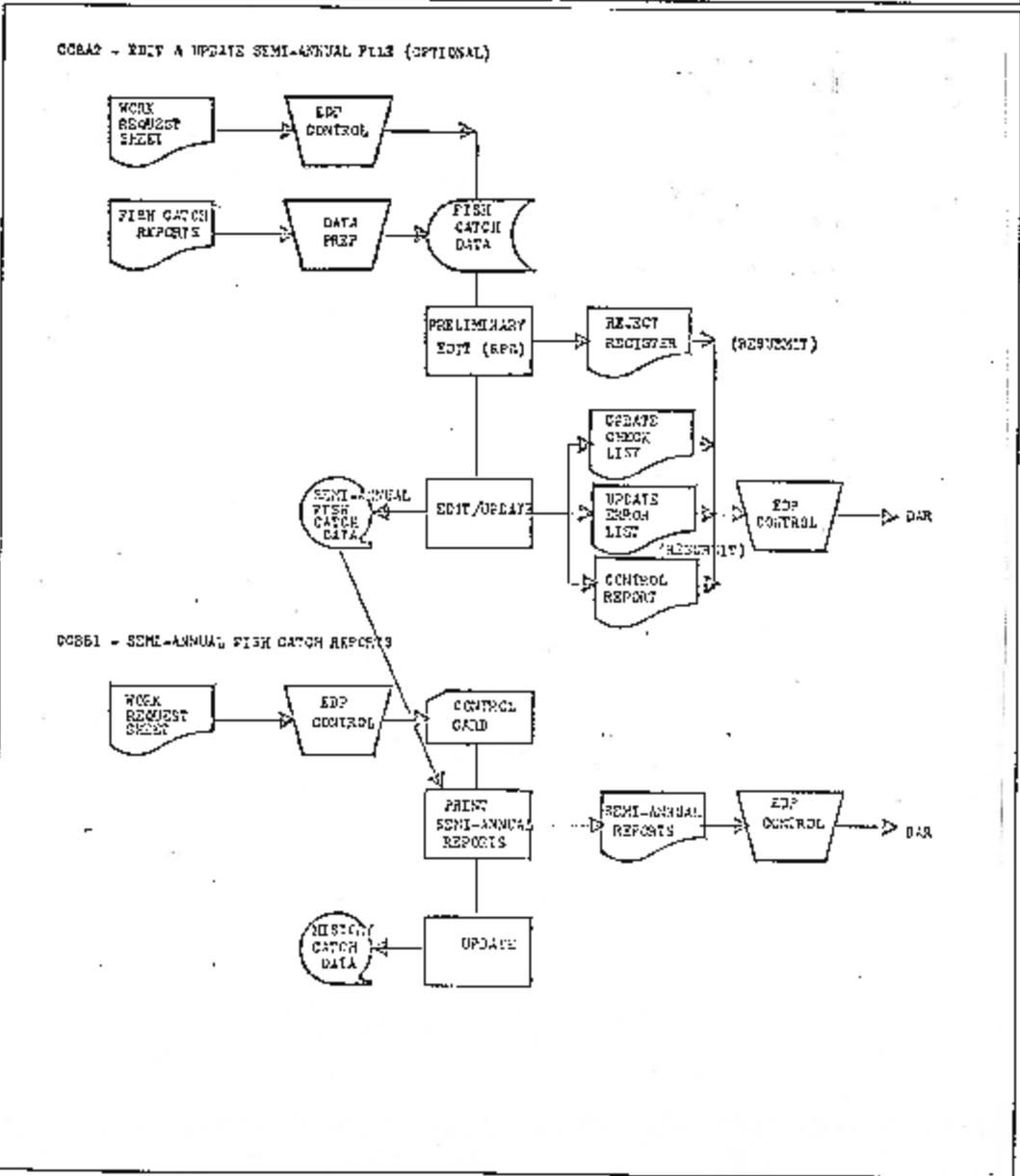
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GENERAL  
DOCUMENTATION FORM

PROJECT NUMBER	
DATE	
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PHASE	SYSTEM TITLE COMMERCIAL FISHERIES INFORMATION SYSTEM	DOCUMENT PART	
	TASK NUMBER COMMERCIAL FISH CATCH DATA SYSTEM	DOCUMENT SECTION	APPENDIX C



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**Appendix II.4d  
Fishing Method Codes**

<u>Code</u>	<u>Method/gear</u>	<u>Report form</u>	<u>Effect.</u>	<u>Discont.</u>
1	Aku boat pole & line	Aku boat catch	1948	
2	Longline or flagline	Longline trip	1948	
3	Deep-sea handline	Bottom H/L trip, Fishing Federal NWHI Daily log	1948 1995	
4	Inshore handline	Fishing	1948	
5	Kaka line	Fishing	1948	
6	Trolling - miscellaneous	Fishing	1949	
7	Shark liver	Fishing	1949	
8	Ika-shibi	Fishing, Tuna H/L trip	1982	
9	Palu ahi	Fishing, Tuna H/L trip	1982	
10	Casting	Fishing	1987	
11	Traps – miscellaneous	Fishing, Net/Trap/Dive	1948	
12	Knife – harvest opihi	Fishing	1948	2002
13	Spear/Spearfishing	Fishing, Net/Trap/Dive	1948	
14	Diving	Fishing, Net/Trap/Dive	1948	
15	Black coral dive	Fishing	1981	
20	Nets – miscellaneous	Fishing, Net/Trap/Dive	1948	
21	Lift net	Fishing, Net/Trap/Dive	1948	
22	Gill net	Fishing, Net/Trap/Dive	1948	
23	Seine net	Fishing, Net/Trap/Dive	1948	
24	Bullpen trap	Fishing, Net/Trap/Dive	1948	
25	Lobster net	Fishing, Net/Trap/Dive	1948	
26	Crab net	Fishing, Net/Trap/Dive	1948	
27	Throw net	Fishing, Net/Trap/Dive	1948	
28	Bag net	Fishing, Net/Trap/Dive	1948	2002
29	Turtle net	Fishing	1948	
30	Bait net	Fishing, Bait	1948	
31	Surround net	Fishing, Net/Trap/Dive	1953	2002
32	Shrimp trawl net	Fishing, Net/Trap/Dive	2002	
33	Pelagic purse seine net	Fishing, Net/Trap/Dive	2002	
35	Tuna handline (misc.)	Fishing	1985	
40	Kona crab net	Fishing, Net/Trap/Dive	1954	
45	Aquarium dive	Aquarium	1976	
51	Crab trap	Fishing, Net/Trap/Dive	1985	
52	Fish trap	Fishing, Net/Trap/Dive	1985	
53	Lobster trap	Fishing, Net/Trap/Dive	1985	
54	Shrimp trap	Fishing, Net/Trap/Dive	1986	
60	Handpicked	Fishing	1984	
61	Trolling w/ lure	Fishing, Tuna H/L trip	2002	
62	Trolling w/ bait	Fishing, Tuna H/L trip	2002	
63	Trolling w/ green stick	Fishing, Tuna H/L trip	2002	
70	Albacore troll	Albacore Troll trip	1995	

<b>90</b>	Pond operator	Pond	1948	2002
<b>91</b>	Floatline	Fishing	2002	
<b>92</b>	Shortline	Fishing, Tuna H/L Trip	2002	
<b>93</b>	Vertical longline	Fishing, Tuna H/L Trip	2002	
<b>97</b>	Unknown	Fishing	?	2002
	Tuna handline - hybrid	Fishing, Tuna H/L trip	2002	
<b>98</b>	Submersible	Fishing	1985	
<b>99</b>	Unknown or other	Fishing	1948	

## **Appendix II.4e**

### **Fishing Method Definitions**

**Aku boat - pole & line (1)** - Fishing for aku (skipjack tuna) using live bait such as nehu or iao and or artificial lures. Generally, live bait and/or water is flung or sprayed out from the stern of the (often drifting) vessel to “chum up the school” and get them feeding. Fishers on the stern of the boat often jig and slap the water with poles to increase surface feeding behavior. Fish are hooked with pole and line, using a barbless hook (feathered, baited or not). Typical species: includes aku, yellowfin and bigeye tuna, mahimahi, kamanu, other surface feeding pelagics.

**Longline or flagline (2)** – Fishing by deploying a mainline, equal to or more than one nautical mile in length, suspended more or less horizontally from the surface by floats from which branchlines with baited hooks are attached at varying depths to attract various tunas, swordfish, marlins, and other large pelagic species that feed at those depths. Typical species: includes yellowfin, albacore and bigeye tuna, swordfish, marlins, mahimahi, ono, sharks, etc. The Longline Trip Report was discontinued in 2002 to reduce duplicate reporting by fishers. Longline trip fishing effort and total catch data are available from Federal Longline Daily Log reports required by NOAA Fisheries, Honolulu Laboratory through the data sharing agreement between DAR and NOAA Fisheries. The longline trip ex-vessel landing data is collected through the Fish Dealer Report System.

**Deep-sea handline (3)** – Fishing from a vessel using a vertical mainline with single or multiple baited hooks and weight, lowered near the bottom. The line is retrieved manually, or by any other powered method. Typical species: includes opakapaka, kalekale, onaga, ehu, etc.

**Inshore handline (4)** – Fishing from a vessel using a vertical mainline with single/multiple lures or baited hooks and weight, lowered near the bottom to include drifting for octopus (tako) while using a handline. Fishing tackle usually consists of lighter gear than deep-sea handline. Line can be retrieved manually or by any other powered method. Typical species: includes opelu, akule, moana, weke nono, menpachi, etc.

**Kaka line – set line (5)** – Fishing with a gear consisting of a mainline less than one nautical mile in length to which are attached multiple branchlines with baited hooks. Mainline is set horizontally, and fixed on or near the bottom, or in shallow water. Typical species: various species, depending on targeted species, e.g., nearshore or pelagics.

**Trolling (6)** – Fishing by towing or dragging line(s) with artificial lure(s) or dead or live bait using a sail, surf or motor-powered vessel underway. Typical species: including mahimahi, ono, billfishes (marlin, sailfishes, etc.), kaku, uluas, kamanu,

tunas, etc. After the new fish reports were implemented on October 2002, this code was used exclusively as miscellaneous troll method.

**Shark liver (7)** – Specific description of method is not known.

**Ika-shibi (8)** – Fishing (mainly at night) using a vertical mainline with high-test monofilament leader, from which is suspended a single baited hook. A weight may be used between the mainline and leader, with four or more lines usually attached to the vessel by breakaway links. A sea anchor is used to control and slow (at times stop) the drift of the vessel. A small light is usually suspended from the boat to attract muhe'e ("true squid") or opelu, typically used as bait. Line may be hauled manually, mechanically or by any powered method. Typical species: yellowfin, albacore or bigeye tuna, mahimahi, swordfish, marlins, muhe'e, etc.

**Palu ahi (9)** – Similar to "ika-shibi" (above), fishing usually takes place during the daytime. Sometimes instead of using lead weights, the baited hook and cut pieces of bait ("chum") are laid on a stone and the leader is wrapped around the stone and secured with a slipknot. The line wrapped stone is then lowered to the desired depth, where a tug on the line releases the slipknot, dispersing the chum and releasing the baited hook. The stone falls to the bottom, leaving the line free to be worked by the fisherman. This method also includes the use of "danglers" for reporting purposes. Typical species: yellowfin, albacore or bigeye tuna, mahimahi, swordfish, marlins, etc.

**Casting (10)** – Fishing from shore or a vessel using a pole and line, typically with a spinning or casting reels. Including various techniques such as whipping with lures or bait, jigging, dunking, slide baiting, fly-fishing or any technique using a pole and line. Typical species: includes various reef, and pelagic fishes.

**Traps (11)** – Fishing with any of various fishing devices made into the shape of a box, container, or enclosure, with one or more openings that allow marine life to get inside but keep them from leaving. Typical species: various fish and crustaceans.

**Knife (12)** – This fishing method was originally defined in 1948 as the manual hand harvesting of opihi using a knife. In 2002, this code was discontinued and the method was reclassified into the "handpicked" or hand harvesting method (code "60").

**Spear/Spearfishing (13)** – Fishing with a shaft with one or more sharpened points at one end usually associated with diving. Includes bow and torch fishing. Typical species: various marine species.

**Diving (14)** – Fishing while swimming free dive (skin diving) or swimming with the assistance of compressed gases (SCUBA, rebreathers, etc.). Examples are lobster or namako diving. Does not include diving with a spear (see spearfishing), a net (see various nets), or for limu or opihi (see handpicking). Typical species: various marine species.

**Black coral dive (15)** – Harvesting black coral by using SCUBA or re-breather diving equipment. Typical species: black coral.

**Nets (20)** – Fishing with various types of nets for specific fishery, configuration, capture method, etc.

**Lift net (21)** – Also known as opelu net. Fishing with a net that captures fish by raising the net from beneath a school of fish. Typical species: opelu and baitfish.

**Lay gill net (22)** – Also known as fence, cross, lay, and pai pai net. Fishing with a net that usually captures fish by entangling the fish's head in the strands of mesh behind the gill covers. The fish are entangled in the mesh rather than being corralled by the net. Typical species: inshore and reef fish.

**Seine net (23)** - This method was originally defined in 1948 and commonly referred to as hukilau net, and it was re-defined in 2002 as "seine net". A similar method, surround net (code 31), was merged under this gear redefinition, and the code was discontinued in 2002.

**Bullpen trap (24)** – Fishing with net(s) fixed in position to form a large stationary enclosure.

**Lobster net (25)** – Fishing with a net with large eye mesh used to entangle lobsters. Typical species: spiny and slipper lobster.

**Crab net (26)** – Fishing normally with a small circular lift net that is used to catch crabs. Typical species: various crabs.

**Throw net (27)** – Fishing with a round or conical shaped net with a weighted outer perimeter that is thrown over fish. Typical species: inshore and reef fish.

**Akule net (28)** – Also known as bag net. This fishing method was originally defined in 1948. In 2002, this code was discontinued and the method was reclassified as "purse seine net" (code "33").

**Turtle net (29)** – Fishing with net gear to capture turtle. This method was discontinued since 1974 when the taking of turtle was prohibited.

**Bait net (30)** – Fishing with a seine net with very small mesh used to catch certain kinds of fish for bait. Typical species: nehu, iao, sardines, and herring.

**Surround net (31)** - This fishing method was originally defined in 1948. In 2002, this code was discontinued and the method was reclassified as “seine net” (code “23”).

**Shrimp trawl net (32)** – Fishing with a net that is dragged through the water by the vessel. Typical species: inshore and reef fish.

**Purse seine net (33)** – This method was originally defined in 1948 and commonly referred to as bag net (code “28”). It was re-classified in 2002 as fishing with a purse seine net (new code “33”) to surround a school of fish and is closed by drawing the bottom of the net together to form a bag.

**Surface pelagic tuna handline (35)** – This method was originally defined in 1985 as miscellaneous tuna handline, including ika-shibi, palu-ahi and dangler methods.

**Kona crab net (40 - loop)** – Fishing with fine stranded netting stretched over a round or square metal frame to form a flat net. Multiple nets are attached to a mainline and set on sandy bottoms like a string of traps. The crabs are trapped when they get entangled in the mesh. Typical species: Kona crab.

**Aquarium collecting (45)** – Fishing with small mesh nets, except throw-nets, and small mesh traps for aquatic life that is kept alive for display. Typical species: various marine species.

**Crab trap (51)** – fishing with traps primarily targeting crabs

**Fish trap (52)** – fishing with traps primarily targeting fish

**Lobster trap (53)** - fishing with traps primarily targeting lobster

**Handpicked (60)** – Hand harvesting marine life by various methods. Typical species: opihi, wana, limu, aama crab, namako, ina, etc.

**Trolling with lure (61)** – using artificial lure

**Trolling with bait (62)** – using dead or live bait

**Trolling with green stick (63)** – also known as bird or uses dangles

**Albacore troll (70)** – Fishing consisting of towing or dragging multiple lines with artificial lures with a vessel underway. Typical species: albacore tuna or other tunas. The Albacore Troll Trip Report was discontinued in 2002 to reduce duplicate reporting by fishers. Albacore troll trip fishing effort and total catch data are available from Federal Albacore Daily Log reports required by NOAA Fisheries through the data sharing agreement between DAR and NOAA Fisheries. The Albacore troll trip ex-vessel landing data is collected through the Fish Dealer Report System.

**Fish Pond (90)** – Enclosed or semi-enclosed coastal body of water used for fish culture. May include a stonewall structure which extends into the ocean and/or some type(s) of makaha (gate) which allows fish to enter and leave the pond. Fishponds are stocked periodically, typically by fishing for pua (juvenile striped mullet) in shoreline areas and/or fish entering through the makaha (or other gaps in the fishpond wall) on incoming tides. Typical species: ‘ama’ ama (striped mullet), aholehole (Hawaiian flagtail), awa (milkfish), awa’ awa (ladyfish), moi (threadfin) and o’io (bonefish). The state Pond Operator’s Monthly Report was discontinued in 2002 to reduce duplicate reporting by fishers. Pond operators are now required to obtain the Aquaculture Facility License to conduct commercial pond operations. The State Aquaculture Development Program (ADP), Department of Agriculture, administers the Aquaculture Facility License, and conducts periodic market surveys of pond harvest sales. The market survey information from ADP is available to replace the discontinued Pond Operator’s Monthly Report.

**Floatline (91)** – Fishing using a horizontal mainline, less than one nautical mile in length and suspended from the ocean surface with floats, from which leaders with baited hooks are suspended. This gear appears similar to longline gear, but is less than one nautical mile in length. Typical species: yellowfin and bigeye tunas and other pelagic species.

**Shortline (92)** – Fishing using a horizontal main-line, less than one nautical mile in length and suspended from the ocean surface with floats, from which leaders with baited hooks are suspended.

**Verticalline (93)** – Fishing using a vertical mainline, suspended from the surface with float, from which leaders with baited hooks are attached and ending with a terminal weight.

**Hybrid (97)** - Various tuna handline methods. A unique mixture of fishing methods used to catch pelagic species primarily on offshore seamounts and near NOAA weather buoys. It is generally a combination of methods including handlining, trolling, baiting techniques and other methods used simultaneously. Typical species: yellowfin and bigeye tunas and other pelagic species. This code was implemented in October 2002. Prior to October 2002, it was used for unknown gear.

**Submersible (98)** - Using a vessel (manned or unmanned) capable of diving and/or remaining underwater for selectively harvesting marine resources, particularly deepwater precious corals. Typical species: black, pink, gold, bamboo corals, etc.

**Unknown (99)** - Other fishing method not previously defined.

## Appendix II.4f

### Fishing Method and Effort Indicators

code	Fishing method	Form type	Sets	Hours	No_gears	Hooks <sup>1</sup>	Net_length <sup>2</sup>	Crew <sup>3</sup>
1	Aku boat	Aku Boat						X
2	Longline <sup>4</sup>	n.a.						
3	Deep-sea handline	Fishing, Deep-sea H/L, Tuna H/L		X	X	X		
4	Inshore handline	Fishing		X	X			
5	Kaka line	Fishing		X	X			
6	Trolling - misc.	Fishing, Deep-sea H/L, Tuna H/L		X	X			
8	Ika-shibi	Fishing, Tuna H/L		X	X			
9	Palu ahi	Fishing, Tuna H/L		X	X			
10	Casting	Fishing, Tuna H/L		X	X			
13	Spearfishing	Fishing, Net, Trap & Dive Activity		X	X			
14	Diving	Fishing, Net, Trap & Dive Activity		X	X			
15	Black coral diving	Fishing		X	X			
21	Lift net	Fishing	X					
22	Gill net	Fishing, Net, Trap & Dive Activity		X			X	
23	Seine net	Fishing, Net, Trap & Dive Activity	X					
24	Bullpen trap	Fishing, Net, Trap & Dive Activity			X			
25	Lobster net	Fishing	X	X	X			
26	Crab net	Fishing			X			
27	Throw net	Fishing	X					
30	Bait net	Bait	X					
32	Shrimp trawl net	Fishing		X			X	
33	Purse seine net	Fishing, Net, Trap & Dive Activity	X					
40	Kona crab net	Fishing			X			
45	Aquarium net	Aquarium		X	X			
51	Crab trap	Fishing, Net, Trap & Dive Activity	X		X			
52	Fish trap	Fishing, Net, Trap & Dive Activity		X	X			
53	Lobster trap	Fishing, Net, Trap & Dive Activity		X	X			
54	Shrimp trap	Fishing, Net, Trap & Dive Activity		X	X			
60	Handpicked	Fishing		X				
61	Trolling - lure	Fishing, Tuna H/L		X	X			
62	Trolling - bait	Fishing, Tuna H/L		X	X			
63	Trolling - stick	Fishing, Tuna H/L		X	X			
70	Albacore troll <sup>5</sup>	n.a.						
90	Fish pond <sup>6</sup>	n.a.						
91	Floatline	Fishing, Tuna H/L		X	X			
97	Hybrid	Tuna H/L		X	X			
98	Submersible	Fishing		X				
99	Other	Fishing		X	X			

<sup>1</sup>gear unit reported on Deep-sea Handline Trip report form only

<sup>2</sup>gear unit collected specifically on Net, Trap, Dive Activity report form; also collected on Fishing report

under "Number fishing lines, traps and net length"

<sup>3</sup>gear unit reported on Aku Boat Trip report form only

<sup>4</sup>discontinued Longline Trip report form effective 1/1/2002, fishing information collected by mandatory NMFS Daily Set and Haul Logs

<sup>5</sup>discontinued Albacore Troll Trip report form effective 1/1/2002, fishing effort information collected by mandatory NMFS trip logs

<sup>6</sup> Fish pond reports will no longer be processed. Pond operator license merges with Aquaculture Facility license. Fish pond harvest survey information available from Aquaculture Development Program

## Appendix II.4g

### Species Codes

<u>Code</u>	<u>Species</u>	<u>Other or local names</u>	<u>Scientific name</u>	<u>Effec.</u>
1	Tuna (misc.)	Dog tooth tuna, misc.	Scombridae	1948
2	Aku	Skipjack tuna	Katsuwonus pelamis	1948
3	Yellowfin tuna	Ahi, koshibi, shibiko	Thunnus albacares	1948
4	Tombo	Albacore	Thunnus alalunga	1948
5	Bluefin tuna		Thunnus thynnus	1948
6	Bigeye tuna	Ahi poonui, bluefin (BI)	Thunnus obesus	1948
7	Kawakawa	Bonito	Euthynnus affinis	1948
8	Billfish (misc.)	Mitsukuri	Istiophoridae	1948
9	Striped marlin	Naragi	Tetrapterus audax	1948
10	Blue marlin	Kajiki	Makaira nigricans	1948
11	Swordfish	Shutome	Xiphias gladius	1948
12	Sailfish	Au lepe	Istiophorus platypterus	1948
13	Mahimahi	Dolphin fish	Coryphaena hippurus	1948
14	Ono	Wahoo	Acanthocybium solandri	1948
15	Hapuupuu	Gouper	Epinephelus quernus	1948
16	Kahala	Amberjack	Seriola dumerili	1948
17	Kalekale	Kalikali	Pristipomoides sieboldii	1948
18	Omilu	Bluefin trevally	Caranx melampygus	1948
19	Opakapaka	Pink snapper	Pristipomoides filamentosus	1948
20	Uku	Grey snapper	Aprion virescens	1948
21	Ehu	Ula ula	Etelis carbunculus	1948
22	Onaga	Ula, ulaula koae	Etelis coruscans	1948
23	Papio/ulua (misc.)		Carangidae	1948

<u>Code</u>	<u>Species</u>	<u>Other or local names</u>	<u>Scientific name</u>	<u>Effec.</u>
24	Weke nono	Moilua, red goat fish	Mulloidichthys pflugeri	1948
25	A'awa	Tableboss	Bodianus bilunulatus	1948
26	Aha	Needle fish, dasu	Belondae	1948
27	Aholehole	Hawaiian flagtail	Kuhlia sandvicensis	1948
28	Akule	Bigeye scad	Selar crumenophthalmus	1948
29	Alaihi	Squirrel fish	Holocentridae	1948
30	Amaama	Mullet	Mugil cephalus	1948
31	Awa	Milkfish	Chanos chanos	1948
32	Summer mullet	Australian mullet	Valamugil engeli	1948
33	Awaaua	Hawaiian ladyfish	Elops hawaiiensis	1948
34	Aweoweo	Bigeye	Heteropriacanthus cruentatus	1948
35	Wrasse (misc.)		Labridae	1948
36	Ehu	Ula ula	Etelis carbunculus	1948
(discontinued code 36 in 1989 – duplicate code; original code is 21)				
37	Halalu	Juvenile bigeye scad	Selar crumenophthalmus	1948
38	Wahanui	Forktail snapper	Aphareus furcatus	1948
39	Hauliuli	Snake mackerel	Gempylus serpens	1948
40	Hihimanu	Sting ray	Dasyatidae	1948
41	Hilu	Wrasse	Coris flavovittata	1948
42	Hinalea	Wrasse	Labridae	1948
43	Humuhumu	Trigger fish	Balistidae	1948
44	Iao	Silversides	Pranesus insularum	1948
45	Iheihe	Halfbeak, ballyhoo	Hemiramphidae	1948
46	Kaku	Barracuda	Sphyraena barracuda	1948

<u>Code</u>	<u>Species</u>	<u>Other or local names</u>	<u>Scientific name</u>	<u>Effec.</u>
47	Kala	Unicorn fish	Naso annulatus, brevirostris, unicornis	1948
48	Kamanu	Rainbow runner	Elagatis bipinnulata	1948
49	Kawalea	Kamasu	Sphyrna helleri	1948
50	Kihikihi	Kagami ulua	Alectis ciliaris	1948
(discontinued code 50 in 1989 – duplicate code; code used is 104)				
51	Kole	Yellow eye kole	Ctenochaetus strigosus	1948
52	Kumu	White saddle goatfish	Parupeneus porphyus	1948
53	Kupipi	Blackspot sergeant damsel fish	Abudefduf sordidus	1948
54	Kupoupou	Cigar wrasse	Cheilio inermis	1948
55	Laenihi	Nabeta	Xyichthys pavo	1948
56	Lae	Leatherback	Scomberoides lysan	1948
57	Lauwiliwili	Butterfly fish	Chaetodon auriga	1948
58	Lehi	Silverjaw jobfish	Aphareus rutilans	1948
59	Maiii	Lavendar tang	Acanthurus nigrofuscus	1948
60	Maiko	Surgeonfish	Acanthurus nigroris	1948
61	Maikoiko	Surgeonfish	Acanthurus leucopareius	1948
62	Malolo	Flying Fish	Exocoetidae	1948
63	Ma'o ma'o	Sergeant major	Abudefduf abdominalis	1948
64	Manini	Convict tang	Acanthurus triostegus	1948
65	Mano	Shark (misc.)	Euselachii	1948
66	Hammerhead shark	Mano kihikihi	Sphyrna spp.	1948
67	Makaiwa	Sardine	Etrumeus micropus	1948
68	Moana	Manybar goat fish	Parupeneus multifaciatus	1948

<u>Code</u>	<u>Species</u>	<u>Other or local names</u>	<u>Scientific name</u>	<u>Effec.</u>
69	Moi	Moi li'i, threadfin	<i>Polydactylus sexfilis</i>	1948
70	Weke ula	Moelua	<i>Mulloidichthys pflugeri</i>	1948
(discontinued code 70 in 1989 – duplicate code; original code is 24)				
71	Mu	Porgy, medai"	<i>Monotaxis grandoculis</i>	1948
72	Naenae	Olive tang	<i>Acanthurus olivaceus</i>	1948
73	Nehu	Anchovy	<i>Stolephorus purpureus</i>	1948
74	Nenuē	Rudder fish	<i>Kyphosus bigibbus</i> , <i>K. cinerescens</i>	1948
75	Nohu	Scorpion fish	<i>Scorpaenopsis</i> spp.	1948
76	Nunu	Trumpet fish	<i>Aulostromus chinensis</i>	1948
77	Loulu	Broomtail, filefish, oililepa	<i>Osbeckia scripta</i>	1948
78	Oio	Bone fish	<i>Albula glossodonta</i>	1948
79	Omaka	Yellowtail scad	<i>Caranx mate</i>	1948
80	Oopu hue	Puffer fish	<i>Diodon</i> spp.	1948
81	Opelu	Mackerel scad	<i>Decapterus macarellus</i>	1948
82	Opule	Pearl wrasse	<i>Anapses cuvier</i>	1948
83	Yellow tang	Pala, yellow manini	<i>Zebrasoma flavescens</i>	1948
84	Pakii	Flounder, flatfish	<i>Bothus</i> spp.	1948
85	Pakuikui	Achilles tang	<i>Acanthurus achilles</i>	1948
86	Palani	Eyestripe surgeon fish	<i>Acanthurus dussumieri</i>	1948
87	Panuhunuhu	Parrot fish, sleeping uhu	<i>Scarus</i> spp.	1948
88	Panunu	Uhu	<i>Scarus</i> spp.	1948
89	Paopao	Yellow ulua	<i>Gnathanodon speciosus</i>	1948
90	Pauu	Squirrel fish	Holocentridae	1948

<u>Code</u>	<u>Species</u>	<u>Other or local names</u>	<u>Scientific name</u>	<u>Effec.</u>
91	Piha	Herring	Spratelloides delicatulus	1948
92	Pualu	Ringtail surgeonfish	Acanthurus blochii, A. xanthopterus	1948
93	Puhi (misc.)	Moray eel, puhi	Muraenidae	1948
94	Puhi (black/brown)	Puhi	Gymnothorax spp.	1948
95	Puhi (white)	Tohei, puhi	Congridae spp.	1948
96	Uhu (misc.)	Parrot fish	Scarus spp.	1948
97	Gindai	Ukikiki, tai	Pristipomoides zonatus	1948
98	Uouoa	False mullet	Neomyxus leuciscus	1948
99	Upapalu	Cardinal fish	Apogon kallopterus	1948
100	Mempachi	Uu	Myripristis spp.	1948
101	Alaihi mama	Uukanipo	Adioryx spinifer	1948
102	Walu	Oil fish,	Ruvettus pretiosus	1948
103	Weke (misc.)	Goat fish, weke, oama	Mullidae	1948
104	Kagami	Ulua kihikihi, pompano	Alectis ciliaris	1948
105	Mallatea	Wrasse	Labridae	1948
106	Opah	Moonfish, manendai	Lampris guttatus	1948
107	Shortbill spearfish	Hebi	Tetrapterus angustirostris	1948
108	Black marlin	Silver marlin, hida	Makaira indica	1948
109	Mola mola	Ocean sunfish	Mola mola	1948
110	Malu	Goat fish, maru	Parupeneus pleurostigma	1948
111	Saba	Japanese mackerel	Scomber japonicus	1948
112	Opelu mama	Mackerel, butternose	Decapterus pinnulatus	1948
113	Tilapia	Cichlid	Tilapia sp.	1948
114	Taape	Bluestripe snapper	Lutjanus kasmira	1970

<u>Code</u>	<u>Species</u>	<u>Other or local names</u>	<u>Scientific name</u>	<u>Effec.</u>
115	Toau	Blacktail snapper	Lutjanus fulvus	1979
116	Roi	Royal sea bass	Cephalopholis argus	1980
117	Keokeo	Frigate mackerel	Auxis thazard	1979
118	Monchong	Pomfret, yohando	Taractichthys steindachneri	1981
119	Poo paa	Hawkfish	Cirrhitus spp.	1980
120	Poou	Ringtail wrasse	Cheilinus unifasciatus	1981
121	Munu	Doublebar goatfish	Parupeneus bifasciatus	1985
122	Weke pueo	Nightmare weke,	Upeneus arge	1985
123	Gurutsu	Wahanui, Forktail snapper	Aphareus furcatus	1985
(discontinued code 123 in 1989 – duplicate code; code used is 38)				
124	Opelu kala	Kala holo	Naso hexacanthus	1985
125	Kalalei	Umaumalei	Naso lituratus	2002
126	Api	Whitespotted surgeonfish	Acanthurus guttatus	2002
127	Weke-ula	Yellowfin goatfish	Mulloidichthys vanicolensis	2002
128	Weke a'a	Yellowstripe goatfish	Mulloidichthys flavolineatus	2002
129	Black kole		Ctenochaetus Hawaiiensis	2002
133	Gold spot herring		Herklotsichthy quadrimaculatus	1985
140	Armorhead		Pseudopentaceros richardsoni	1985
141	Alfonsin		Beryx decadactylus	1985
200	Butaguchi	Pig lip ulua	Pseudocaranx dentex	1981

<u>Code</u>	<u>Species</u>	<u>Other or local names</u>	<u>Scientific name</u>	<u>Effec.</u>
201	Dobe	Dusky	Caranx helvolus	1981
202	Gunkan	Black ulua	Caranx lugubris	1981
203	Sasa	Bigeye jack	Caranx sexfasciatus	1981
204	Papa	Island jack	Carangoides orthogrammus	1981
205	White papio/ulua	Ulua aukea, giant ulua	Caranx ignoblis	1981
206	Moano kale	Aoweke, anahuli, moana kea, moana papa	Parupeneus cyclostomus	1981
207	Randall's snapper		Randallichthys filamentosus	1996
208	Yellow-tail kali	Purple paka	Pristipomoides auricilla	1996
209	Golden kali	Boga	Erythrocles schegelii	1997
220	No-bite	Schleger's jack	Carangoides equula	2002
221	Barred jack	Blue trevally	Carangoides ferdau	2002
300	Hogo	Scorpion fish	Pontinus macrocephalus	1985
320	Mako		Isurus oxyrinchus	1985
321	Thresher shark		Alopias vulpinus	1985
322	Tiger shark		Galeocerdo cuvieri	1985
323	Blue shark		Euselachii	1999
324	Oceanic whitetip shark		Euselachii	1999
360	Mako fins		Euselachii	1999
361	Thresher fins		Euselachii	1999
362	Tiger shark fins		Euselachii	1999
363	Blue shark fins		Euselachii	1999
364	Oceanic w/t fins		Euselachii	1999

<u>Code</u>	<u>Species</u>	<u>Other or local names</u>	<u>Scientific name</u>	<u>Effec.</u>
365	Mano fins		Euselachii	1999
366	Hammerhead fins		Euselachii	1999
<b>400-599</b>		Shells		2006
600	Bass	Freshwater		1948
601	Carp	Freshwater		1948
602	Catfish	Freshwater		1948
603	Oopu	Freshwater		1948
604	Panchon	Pangii, Freshwater		1948
700	Crab (misc.)	7-11 crab, stone crab	Carpilius maculatus	1948
701	Kona crab		Ranina serrata	1948
702	Kuahonu crab	White crab, koha	Portunus sanguinolentus	1948
703	Hawaiian crab	Moala, red crab	Podophthalmus vigil	1948
704	Samoan crab		Scylla serrata	1948
705	Opaelolo	Tahitian shrimp/prawn	Penaeus marginatus	1948
706	Spiny lobster	Ula	Panulirus	1948
707	Slipper lobster	Ula papapa	Scyllarides	1948
708	Laevigatus	Ama ebi, ono shrimp	Heterocarpus laevigatus	1982
709	Ensifer		Heterocarpus ensifer	1982
710	Aama crab	Black crab	Grapsus tenuicrustatus	1985
711	Blue pincher crab			1985
712	Opae ula		Halocaridinia rubra	2004
713	Metabetaeus lohena		Metabetaeus lohena	2004
716	Red spiny lobster	Hawaiian lobster	Panulirus marginatus	2002
717	Green spiny lobster		Panulirus penicillatus	2002
718	Squammosus	Scaly slipper lobster	Scyllarides squammosus	2002

<u>Code</u>	<u>Species</u>	<u>Other or local names</u>	<u>Scientific name</u>	<u>Effec.</u>
719	Haanii	Ridgeback slipper lobster	Scyllarides haanii	2002
720	Olepe	Clam	Tapes philippinarum	1948
721	Octopus	Tako, he'e,	Octopus spp.	1948
722	Squid	Ika, mizuika, muhe'e	Sepioteuthis lessoniana	1948
723	Hihiwai	Freshwater limpet	Theodoxus spp.	1948
724	Opihi	Saltwater limpet	Cellana spp.	1948
725	Pupu	Top shell		1948
726	He'e (day tako)		Octopus cyanea	2002
727	He'e pu loa	Night tako	Octopus ornatus	2002
728	Opihi 'alina	Yellow foot opihi	Cellana sandwicensis	2002
729	Opihi makaiauli	Black foot opihi	Opihi exarata	2002
750	Ina	Sea urchin eggs	Tripneustes gratilla	1948
751	Wana (sea urchin)	Sea urchin	Echinothrix spp.	1948
752	Namako	Sea cucumber	Holothuridae	1948
753	Ha'uke'uke	Flat urchins	Colobocentrotus atratus	2002
754	Hawae	Collector urchins	Tripneustes gratilla	2002
755	Ina ula	Slate pencil urchins	Heterocentrotus mammillatus	2002
790	Honu	Turtle		1948
800	Limu (misc.)	Halymomia, lipoa, rosip	Gracilaria spp.	1948
801	Limu kohu		Asparagopsis taxiformis	1985
802	Manauea		Gracilaria coronopifolia	1985
803	Ogo		Gracilaria parvispora	1985
804	Wawaeiole	Rat feet Limu, popoklo	Ulva fasciata	1985

<u>Code</u>	<u>Species</u>	<u>Other or local names</u>	<u>Scientific name</u>	<u>Effec.</u>
850	Stony coral		Madreporaria spp.	1988
851	Cauliflower coral		Pocillopora spp.	1988
852	Rose coral		Pocillopora meandrin	1988
853	Tree coral		Pocillopora damicornis	1988
859	Mushroom coral		Fungia scutaria	1988
860	Black coral		Antipathes spp.	1988
870	Pink coral (misc.)		Corallium spp.	1988
871	Pink coral		Corallium secundum	2000
872	Pink coral		Corallium regale	2000
873	Pink coral		Corallium laauense	2000
880	Gold coral (misc.)		Gerardia spp.	1988
881	Gold coral		Gerardia spp.	2000
882	Gold coral		Collogorgia gilberti	2000
883	Gold coral		Narella spp.	2000
884	Gold coral		Calyptrophora spp.	2000
890	Bamboo coral (misc.)			1988
891	Bamboo coral		Lepidisis olapa	2000
892	Bamboo coral		Acanella spp.	2000
901	Shark liver			1948
999	Unknown/unclassified			1948

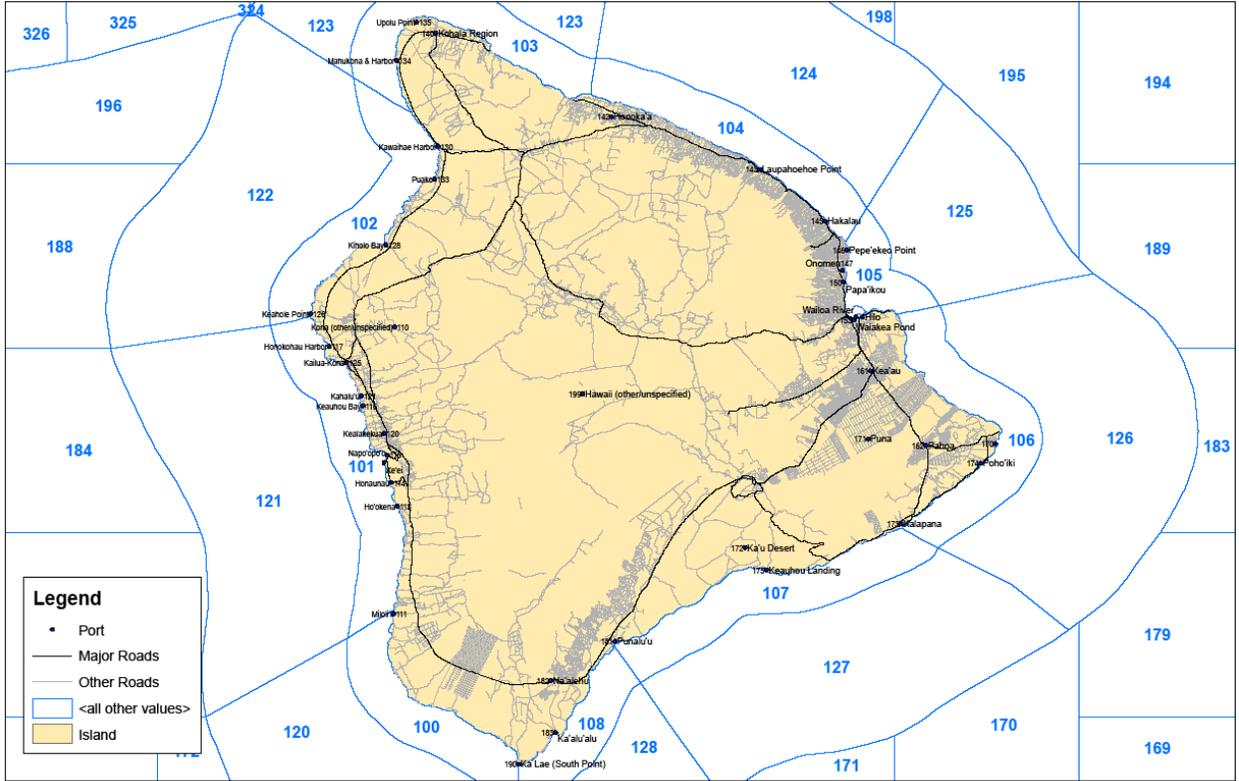
**Appendix II.4h  
Port of Landing Codes**

<u>Code</u>	<u>Port name</u>	<u>Island</u>
101	South Point	Hawaii
110	Kona	Hawaii
111	Milolii	Hawaii
113	Hookena	Hawaii
114	Honaunau	Hawaii
115	Kealakekua, Keei, Napoopoo	Hawaii
116	Keauhou, Kahaluu	Hawaii
117	Honokohau, Kailua-Kona, Kaloko	Hawaii
133	Kawaihae, Puako	Hawaii
134	Mahukona	Hawaii
135	Upolu	Hawaii
142	Waipio, Honokaa	Hawaii
143	Laupahoehoe	Hawaii
152	Hilo, Waiakea, Wailoa, Papaikou	Hawaii
161	Keaau	Hawaii
162	Pahoa	Hawaii
171	Pohoiki, Komoamoa, Kapoho Pt, Opihikau, Kalapana, Puna	Hawaii
172	Kau Desert	Hawaii
181	Punaluu (Big Island)	Hawaii
182	Ka Lae, Kaulana, Kaalualu, Naalehu	Hawaii
199	Other Hawaii	Hawaii
201	Kaupo	Maui
202	Kanahena Pt, Kahikinui	Maui
211	Makena, Keawakapu, Keoneoio	Maui
221	Kihei, Kamaole	Maui
222	Maalaea	Maui
230	Lahaina	Maui
231	Olowalu	Maui
232	Mala Wharf, Kahana	Maui
233	Kaanapali, Honokowai	Maui
261	Honolua	Maui
262	Waihee, Kahakuloa	Maui
271	Kahului, Wailuku, NASKA, Kanaha	Maui
272	Spreckelsville	Maui
273	Paia, Kuau	Maui
281	Maliko, Pauwela, Haiku	Maui
283	Keanae, Nahiku, Peahi	Maui
284	Hana	Maui
299	Other Maui	Maui
302	Kaumalapau	Lanai
322	Awalua Beach	Lanai
323	Kahea Beach	Lanai

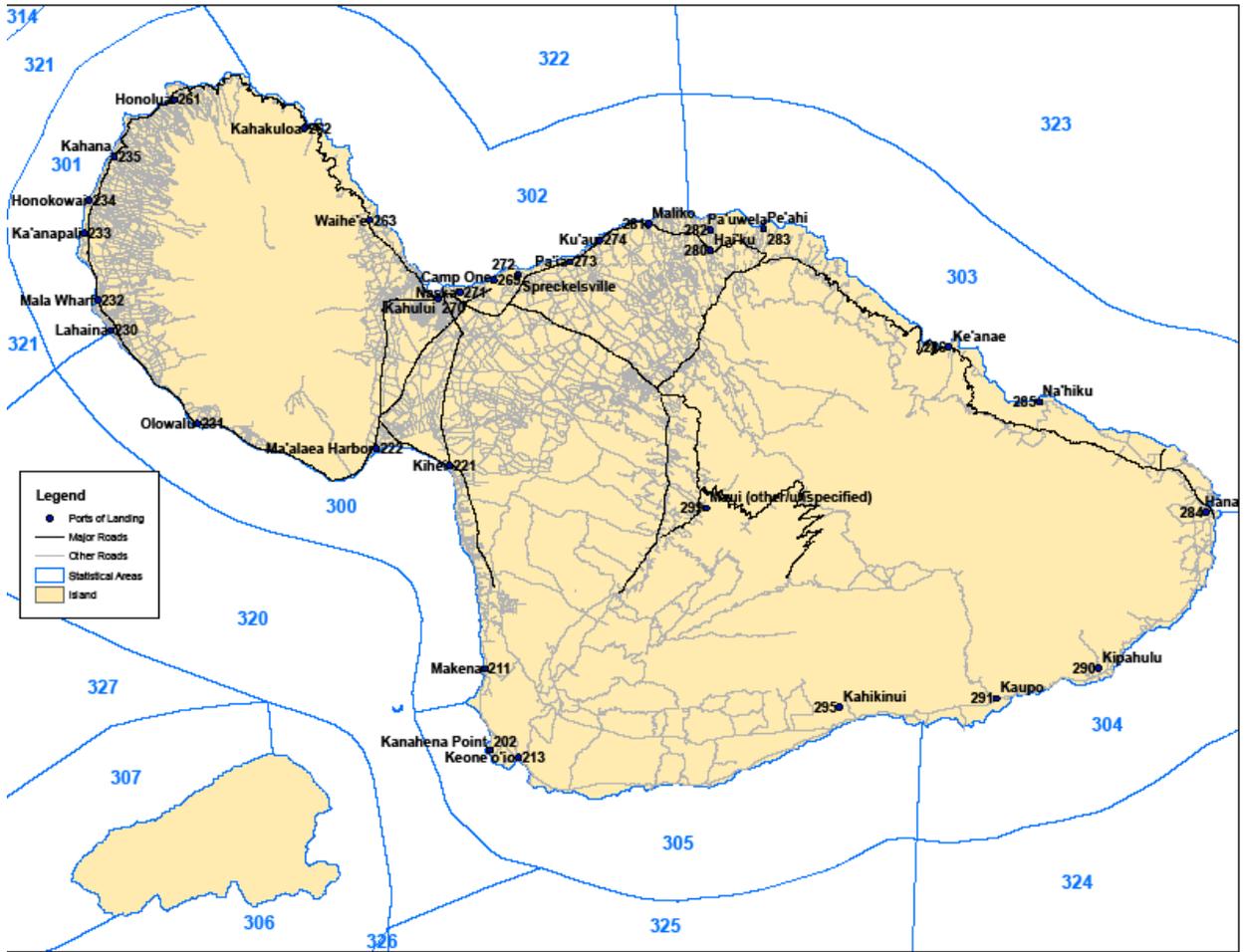
<u>Code</u>	<u>Port name</u>	<u>Island</u>
325	Keomuku Harbor	Lanai
343	Manele Beach	Lanai
399	Other Lanai	Lanai
411	Palaau District	Molokai
415	Halawa	Molokai
422	Honouli Wai	Molokai
426	Pukoo Harbor	Molokai
427	Kaluaaha	Molokai
429	Keawa Nui Fishpond, Ohia	Molokai
431	Kamalo Harbor	Molokai
452	Kawela	Molokai
453	Kamiloloa	Molokai
454	Kaunakakai	Molokai
461	Kolo Harbor	Molokai
499	Other Molokai	Molokai
501	Koko Head, Maunalua B, Hawaii Kai, Portlock, Koko Marina	Oahu
502	Diamond Head, Ala Moana, Waikiki, Ala Wai, Ilikai	Oahu
511	Kewalo Basin	Oahu
512	Honolulu, Keehi, Sand Island	Oahu
513	Kalihi	Oahu
515	Moanalua Bridge	Oahu
522	Aiea, Rainbow Bay	Oahu
523	Pearl City, Waipio, Waipahu	Oahu
524	Hoaeae, Honouliuli	Oahu
525	Ewa, Iroquois Pt.	Oahu
526	Ko Olina	Oahu
527	Barber's Pt. Harbor	Oahu
531	Nanakuli	Oahu
532	Waianae/WBH, Pokai Bay	Oahu
533	Makua	Oahu
540	Waialua	Oahu
542	Haleiwa	Oahu
543	Waimea Bay, Waialeale	Oahu
561	Kahuku	Oahu
562	Laie, Hauula, Punaluu, Kaaawa	Oahu
563	Kahana Bay	Oahu
570	Kaneohe Bay	Oahu
571	Waikane	Oahu
572	Waiahole	Oahu
573	Heeia, Heeia Kea	Oahu
574	Kaneohe/KYC, Mikiola	Oahu
575	Kahaluu (Oahu)	Oahu
581	Kailua Bay, Lanikai	Oahu

<u>Code</u>	<u>Port name</u>	<u>Island</u>
<b>582</b>	Waimanalo, Makapuu	Oahu
<b>599</b>	Other Oahu, W. Loch, Bishop Pt, Pearl Harbor, Campbell Park	Oahu
<b>601</b>	Koloa	Kauai
<b>602</b>	Kukuiula, Poipu, Makauena Pt.	Kauai
<b>603</b>	Lawai	Kauai
<b>611</b>	Port Allen	Kauai
<b>612</b>	Hanapepe, Eleele	Kauai
<b>613</b>	Makaweli	Kauai
<b>621</b>	Waimea, Polihale	Kauai
<b>631</b>	Mana, Kekaha, Kikiaola	Kauai
<b>661</b>	Haena, Makana	Kauai
<b>662</b>	Hanalei, Wainiha	Kauai
<b>663</b>	Kalihiwai, Kilauea, Moloaa, Anini, Pakala	Kauai
<b>671</b>	Anahola	Kauai
<b>673</b>	Kapaa, Wailua, Waikaea, Waipouli	Kauai
<b>681</b>	Hanamaulu	Kauai
<b>682</b>	Ahukini, Lihue	Kauai
<b>683</b>	Nawiliwili, Puhi, Niumalu	Kauai
<b>699</b>	Other Kauai	Kauai
<b>799</b>	Niihau	Niihau

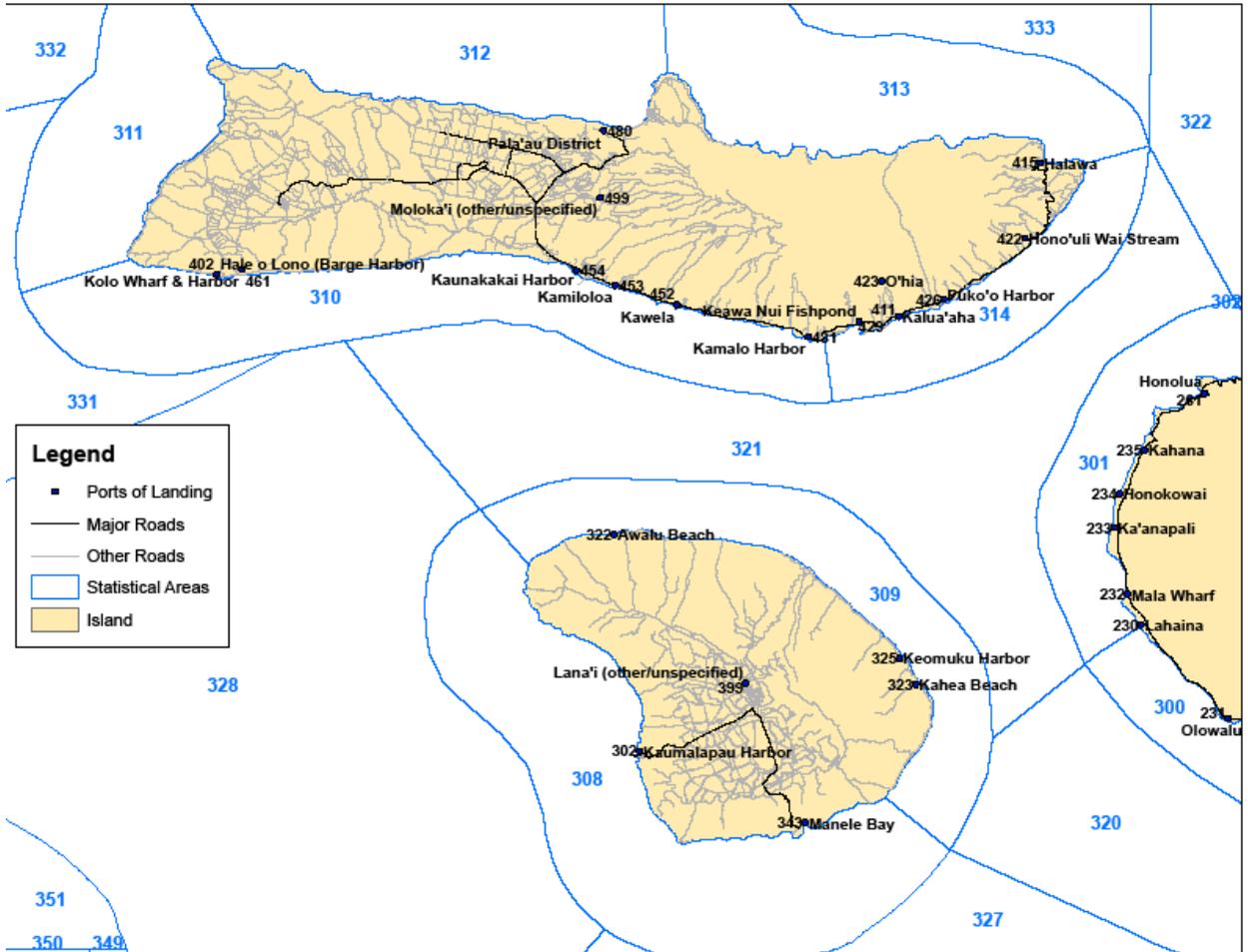
## Appendix II.4i Hawaii Landing Ports



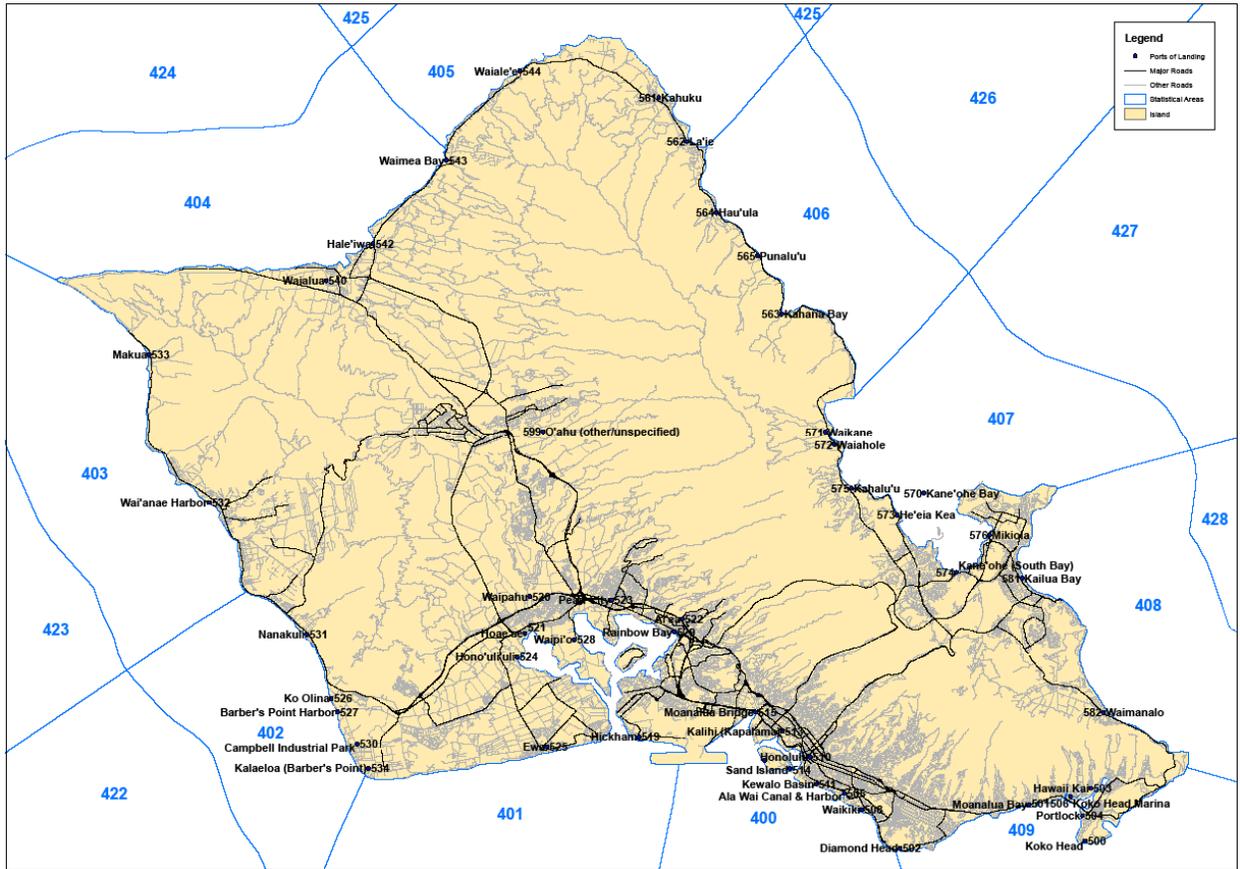
## Appendix II.4j Maui Landing Ports



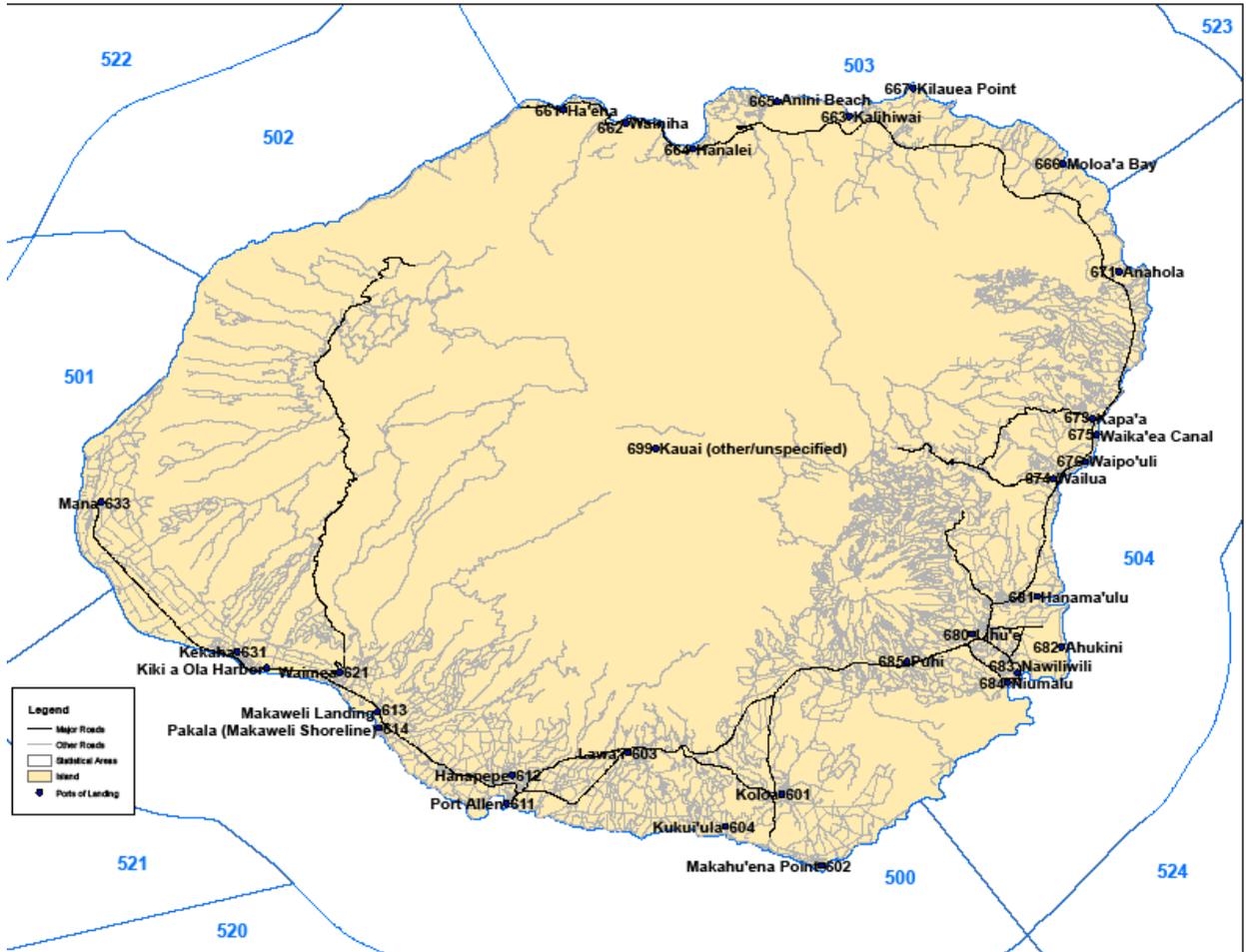
## Appendix II.4k Molokai & Lanai Landing Ports



## Appendix II.4I Oahu Landing Ports

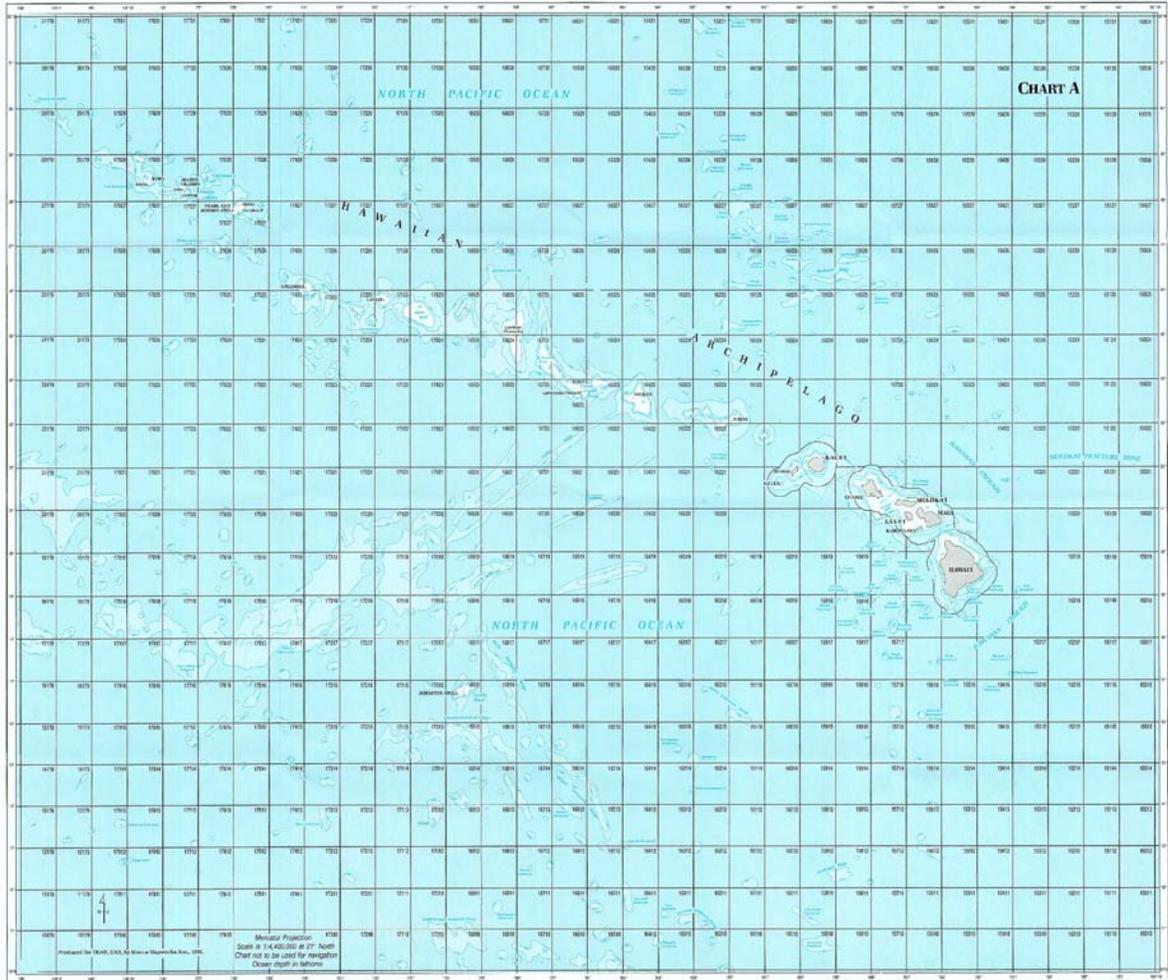


## Appendix II.4m Kauai Landing Ports



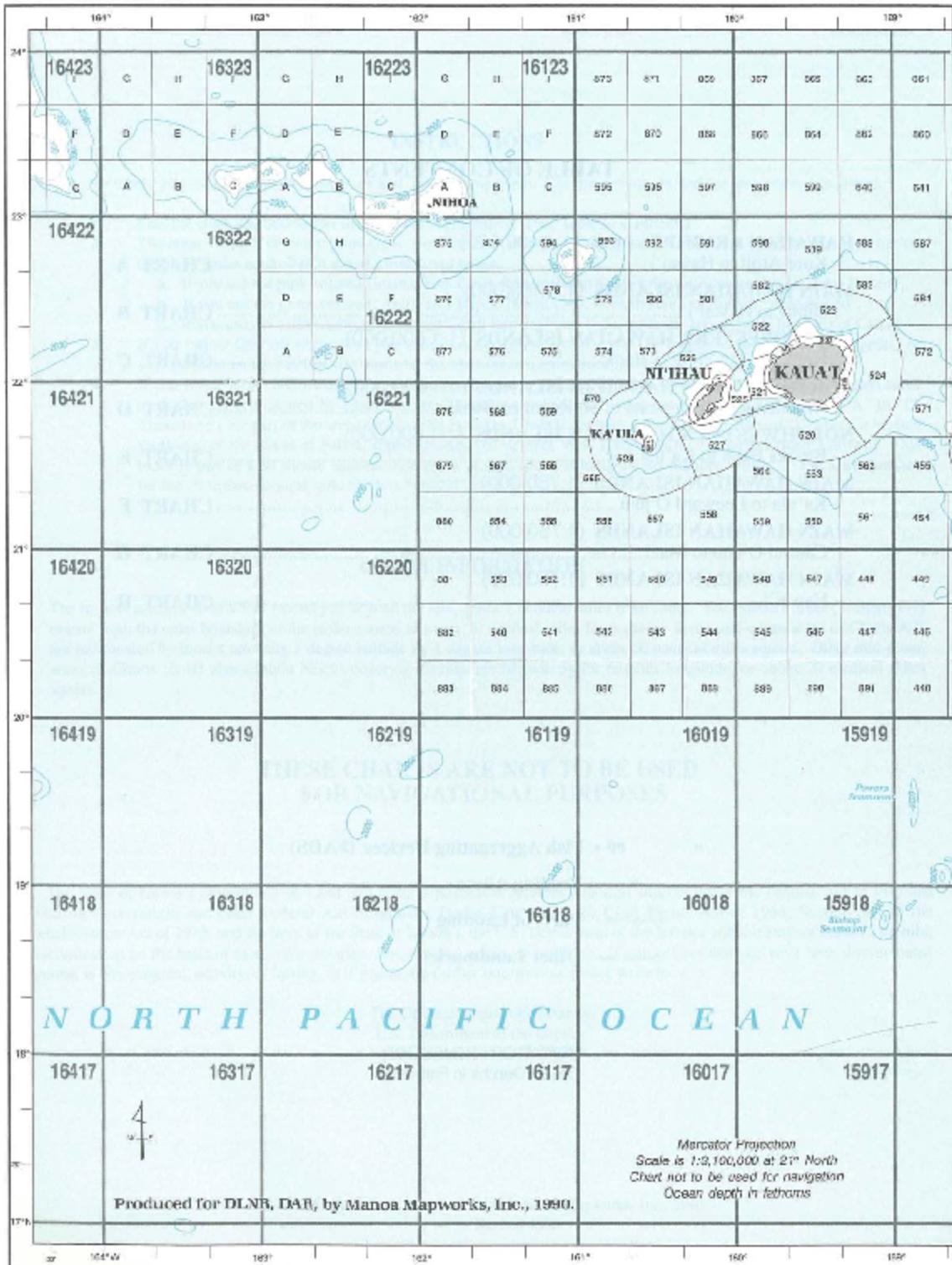
## Appendix II.4n - Chart A

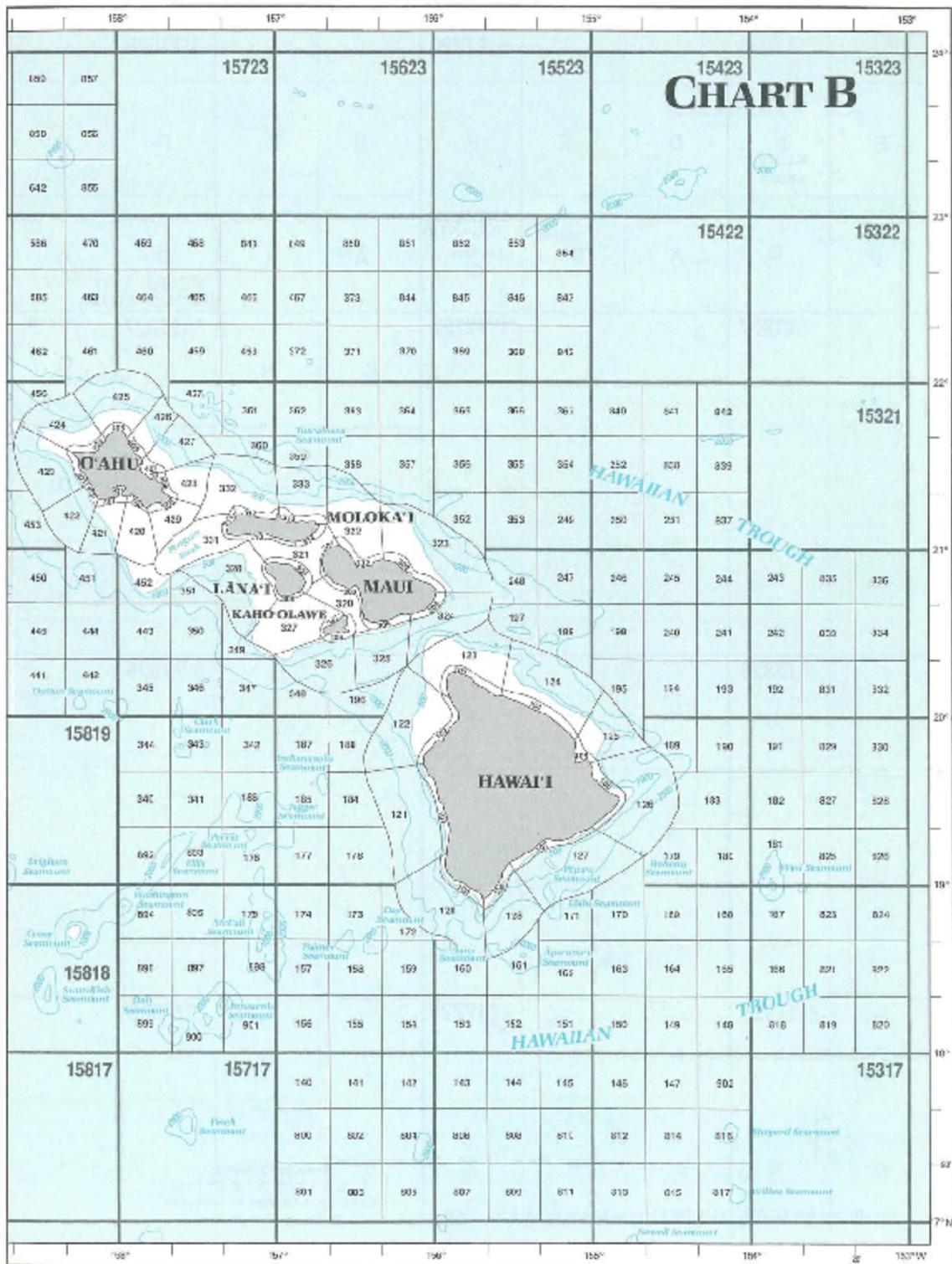
Description: The commercial fisheries statistical area charts were revised in April 1990. This chart was a new design and it was intended primarily for longline fishers or other fishing vessels who fished in far mid-ocean areas from the main Hawaiian Islands (MHI). This set of area codes consists of five-digits and is derived from combining the intersecting latitude and longitude coordinates. Thus, each area covers one-degree, or 60 square nautical miles. The chart provides area coverage from 10°N latitude to 32°N latitude, and from 150° W longitude to 178°E longitude.



## **Appendix II.4o - Chart B**

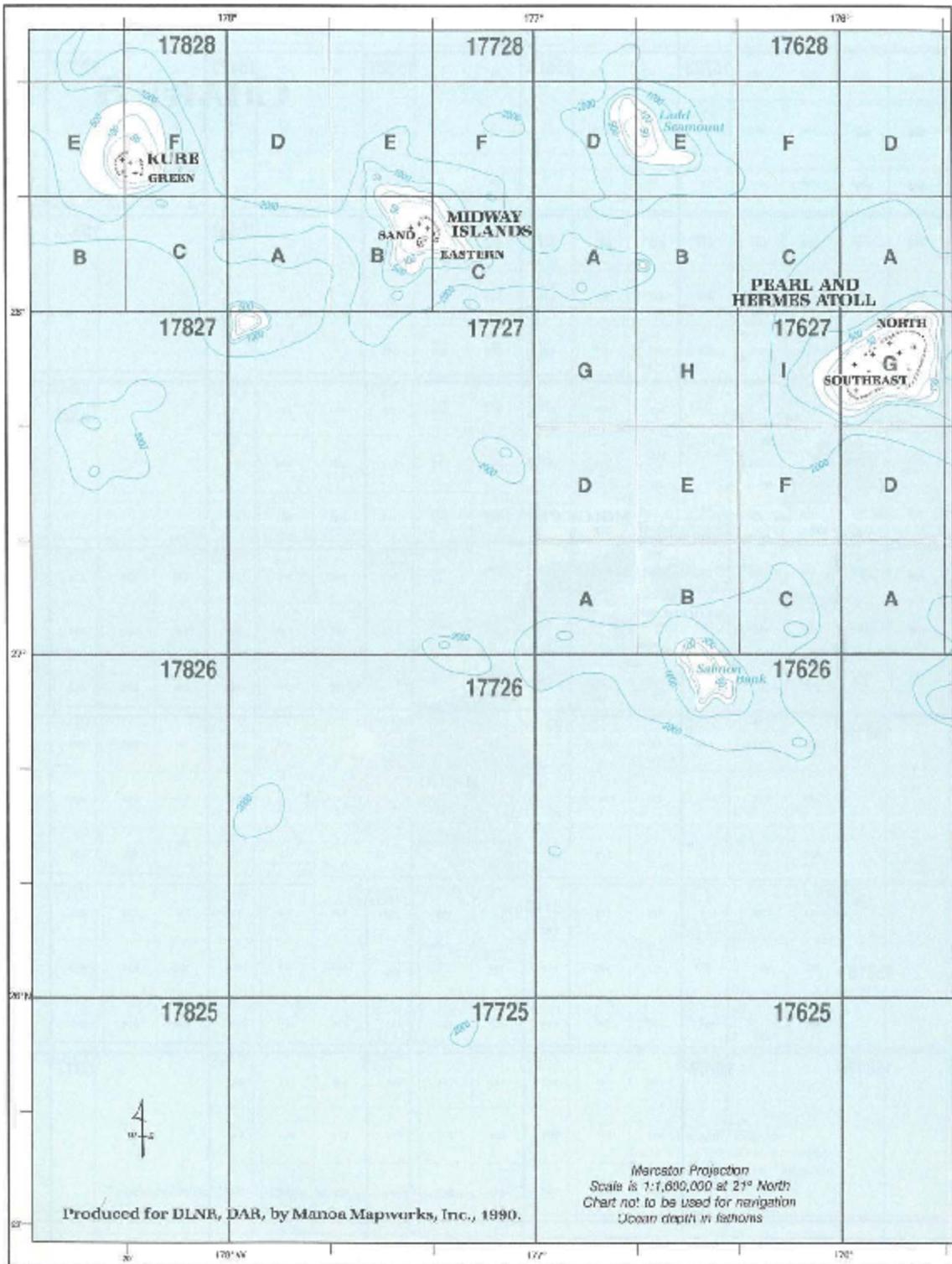
Description: The commercial fisheries statistical area charts were revised in April 1990. This chart was a new design. Some of the original area codes established in 1948 including 100 through 642 were retained, and codes 800 through 901 were added to provide expanded fishing area coverage around the MHI and portions of Nihoa in the NWHI. Except for inshore and offshore areas around the MHI, each area code is approximately 20 square nautical miles.

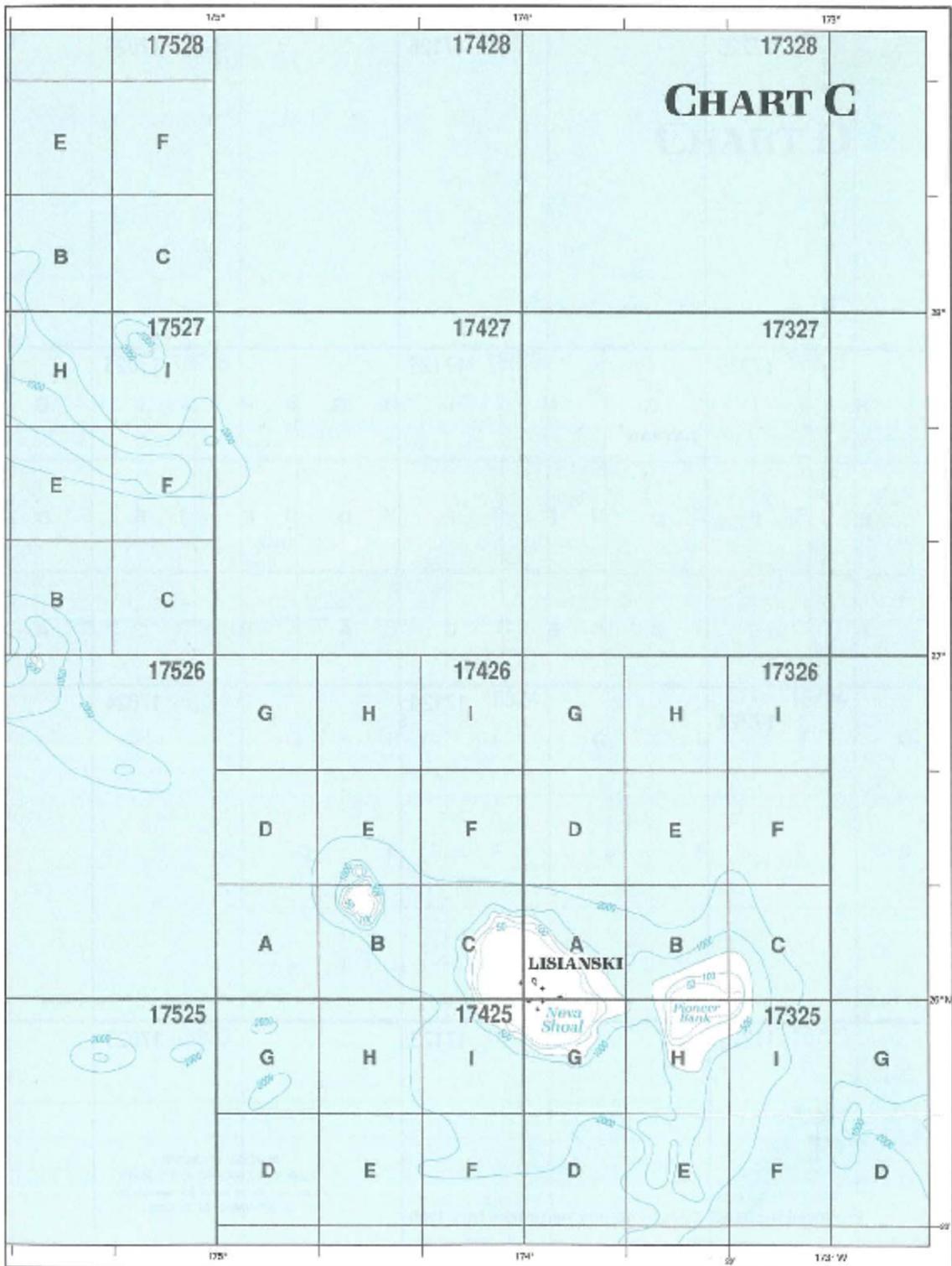




## **Appendix II.4p - Chart C**

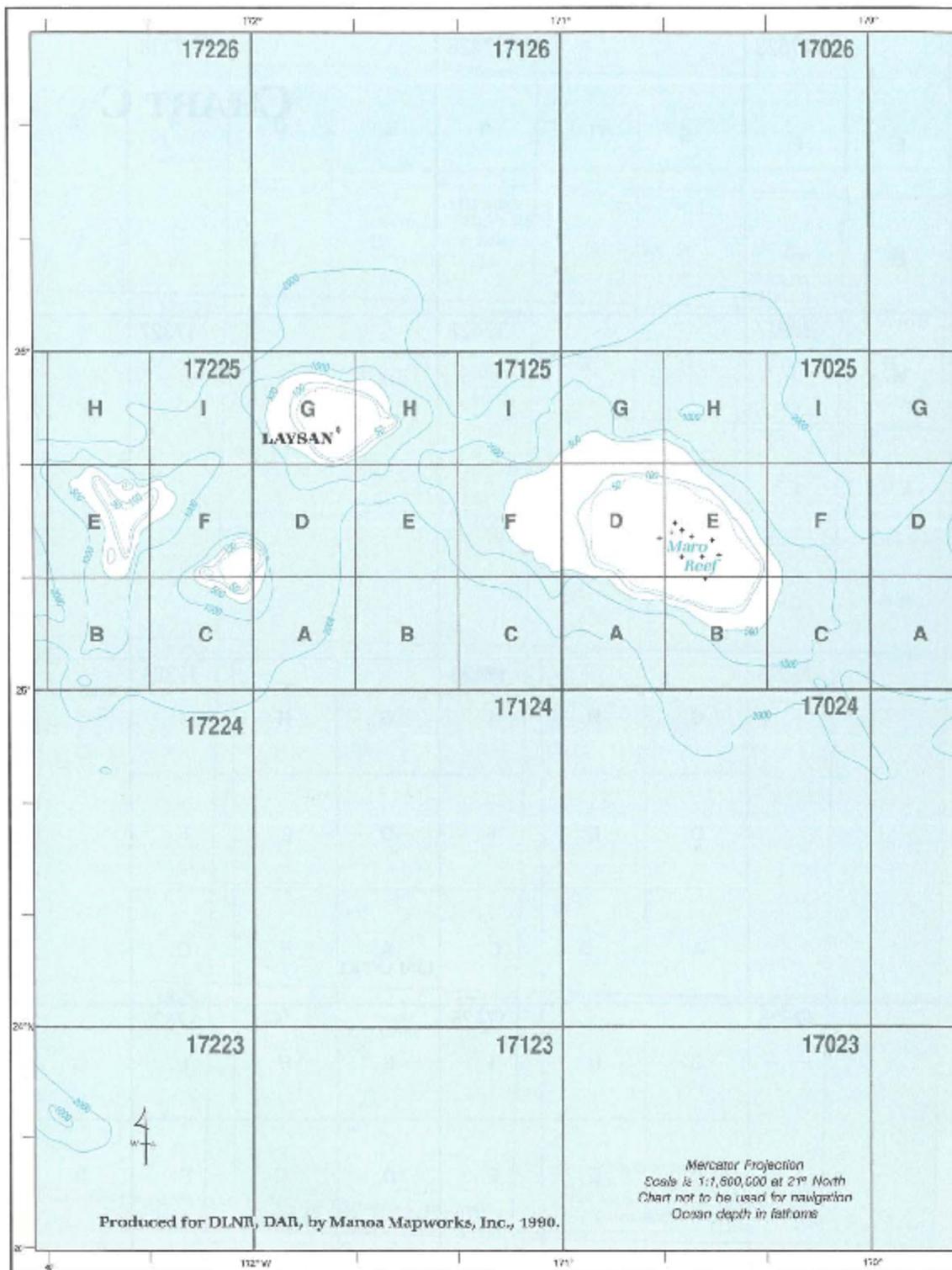
Description: The commercial fisheries statistical area charts were revised in April 1990. This chart was a new design. New area codes were established to provide fishing area coverage in the NWHI from Kure Atoll to Pioneer Bank. Each mid-ocean area consists of five-digit area codes derived from combining the intersecting latitude and longitude coordinates. Thus, each area covers one-degree, or 60 square nautical miles. The smaller size grid areas within the one-degree area provide additional coverage on detail NWHI features and are approximately 20 square nautical miles.

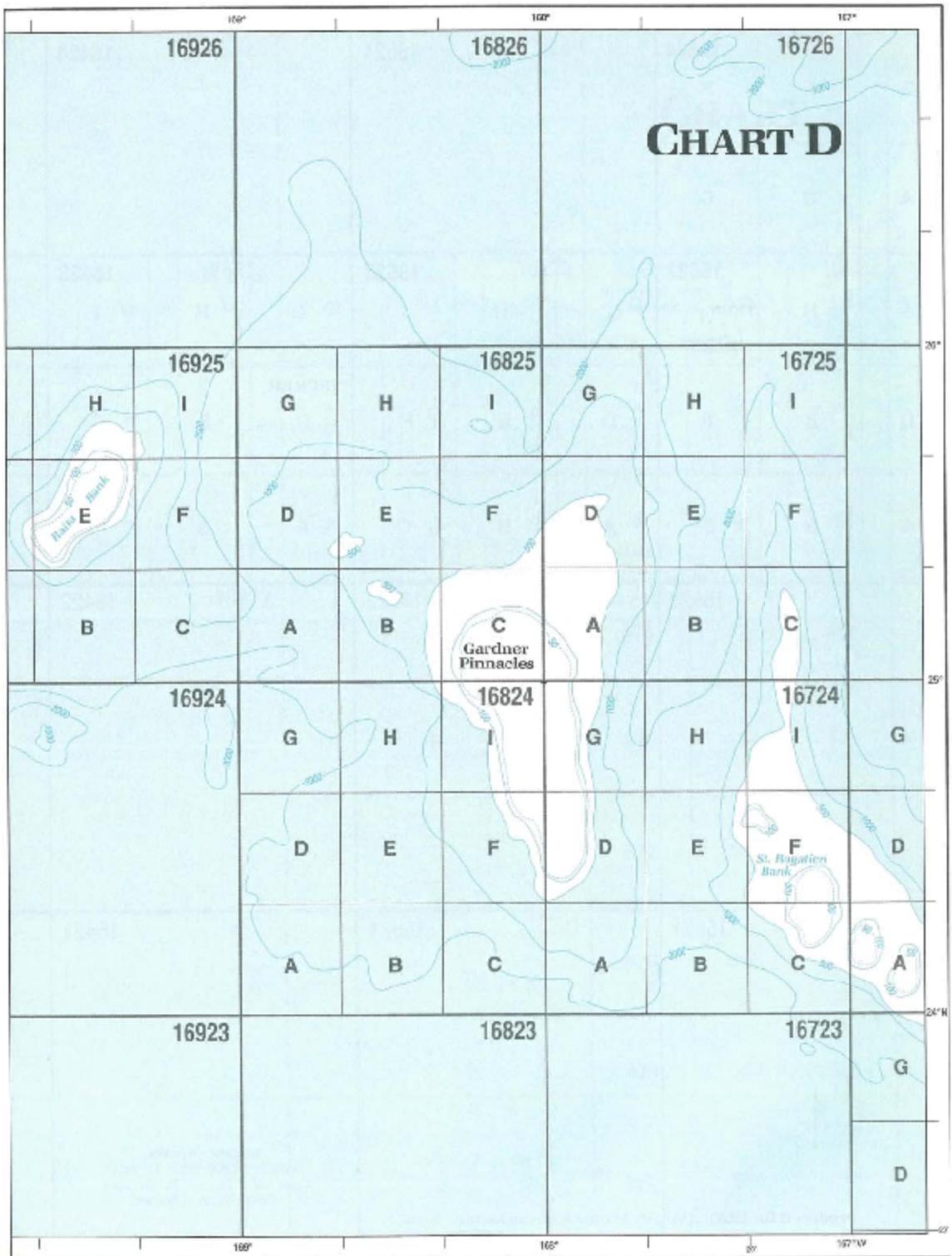




## **Appendix II.4q - Chart D**

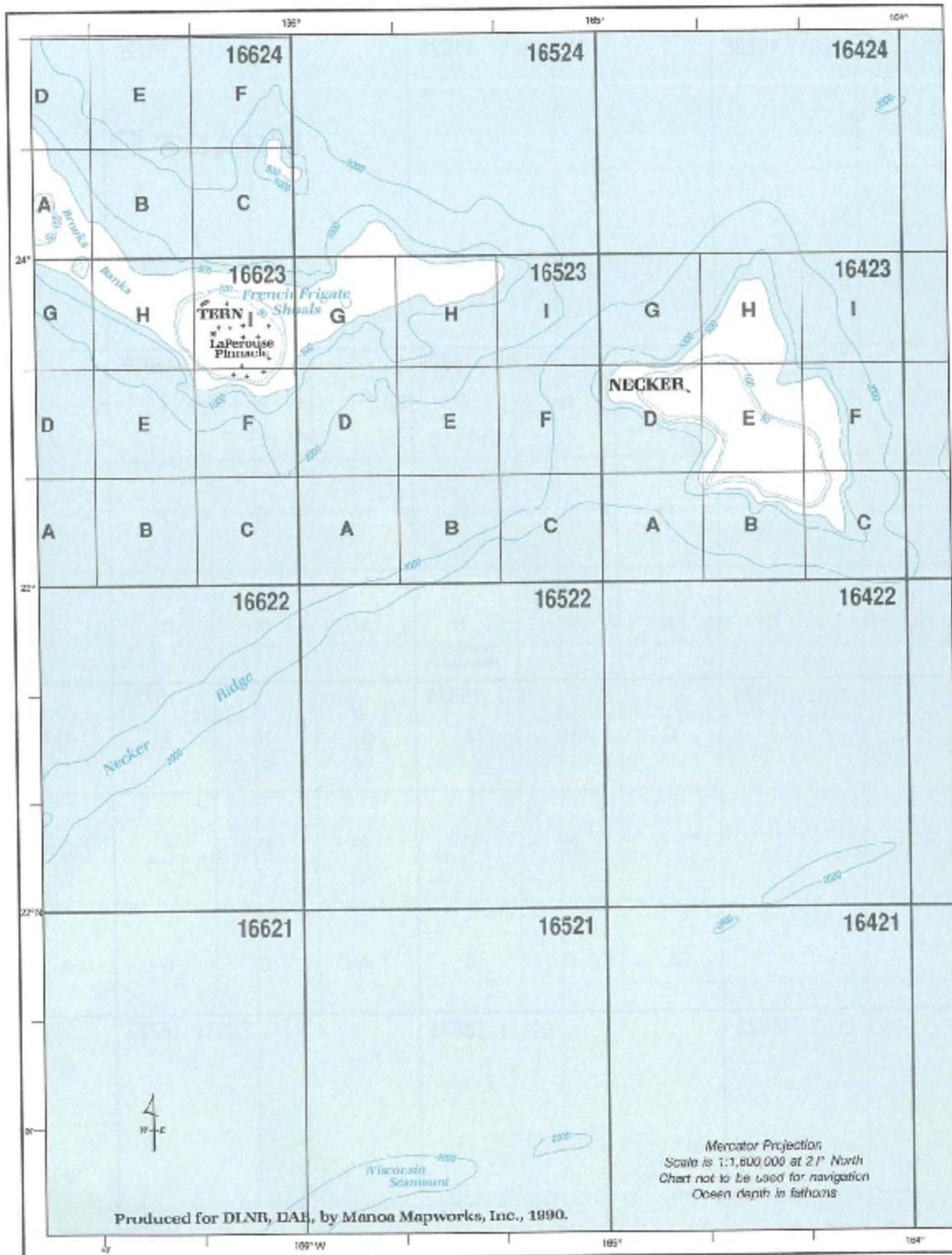
Description: The commercial fisheries statistical area charts were revised in April 1990. New area codes were established to provide fishing area coverage in the NWHI from North Hampton Seamount and Brooks Bank. Each mid-ocean area consists of five-digit area codes derived from combining the intersecting latitude and longitude coordinates. Thus, each area covers one-degree, or 60 square nautical miles. The smaller size grid areas within the one-degree area provide additional coverage on detail NWHI features and are approximately 20 square nautical miles.

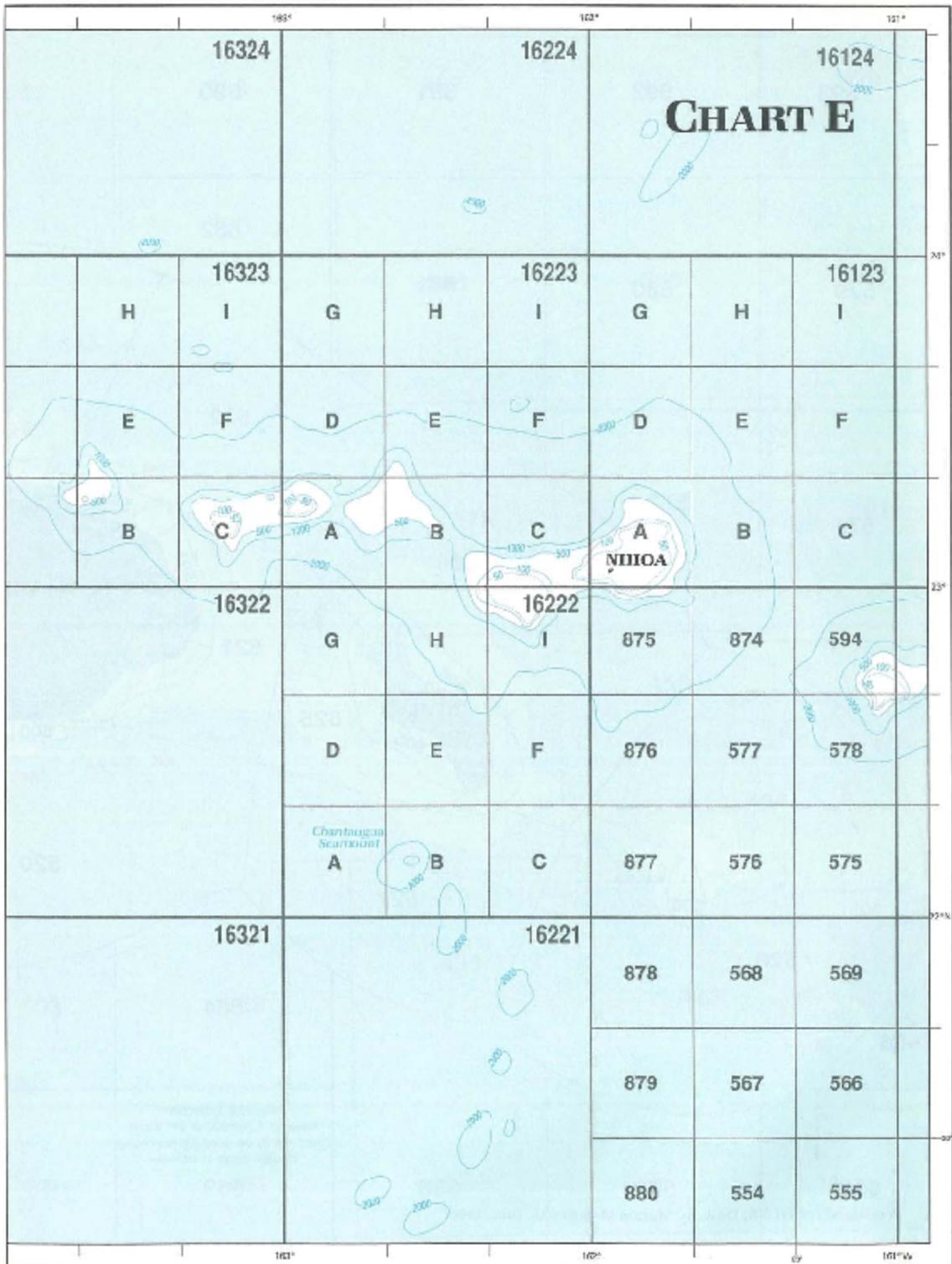




## **Appendix II.4r - Chart E**

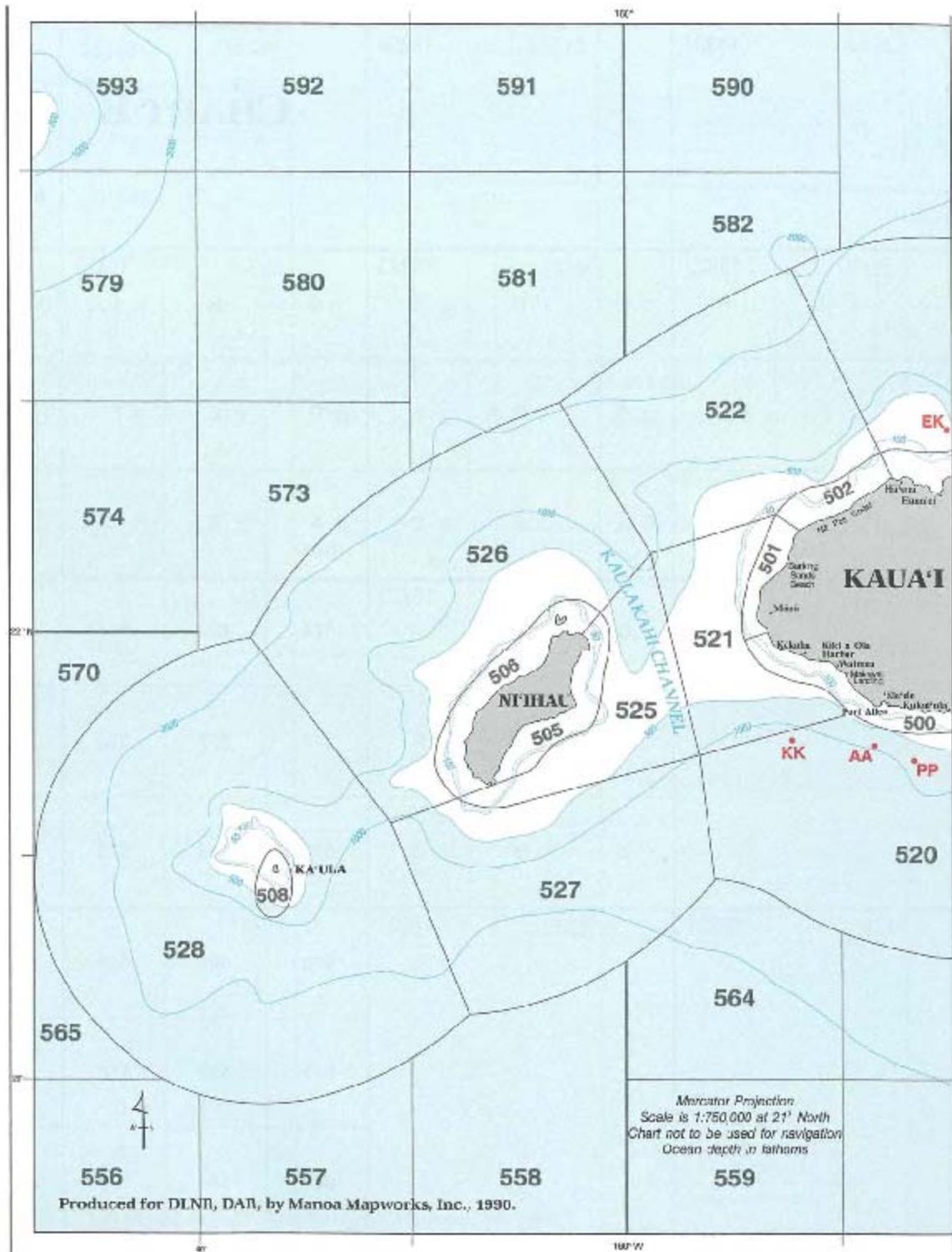
Description: The commercial fisheries statistical area charts were revised in April 1990. Some of the original area codes established in 1948 including 554, 555, 566 through 569, 575 through 578, and 594 were retained, and new area codes were established to provide fishing area coverage in the NWHI from Brooks Bank and Nihoa. Each mid-ocean area consists of five-digit area codes derived from combining the intersecting latitude and longitude coordinates. Thus, each area covers one-degree, or 60 square nautical miles. The smaller size grid areas within the one-degree area provide additional coverage on detail NWHI features and are approximately 20 square nautical miles.

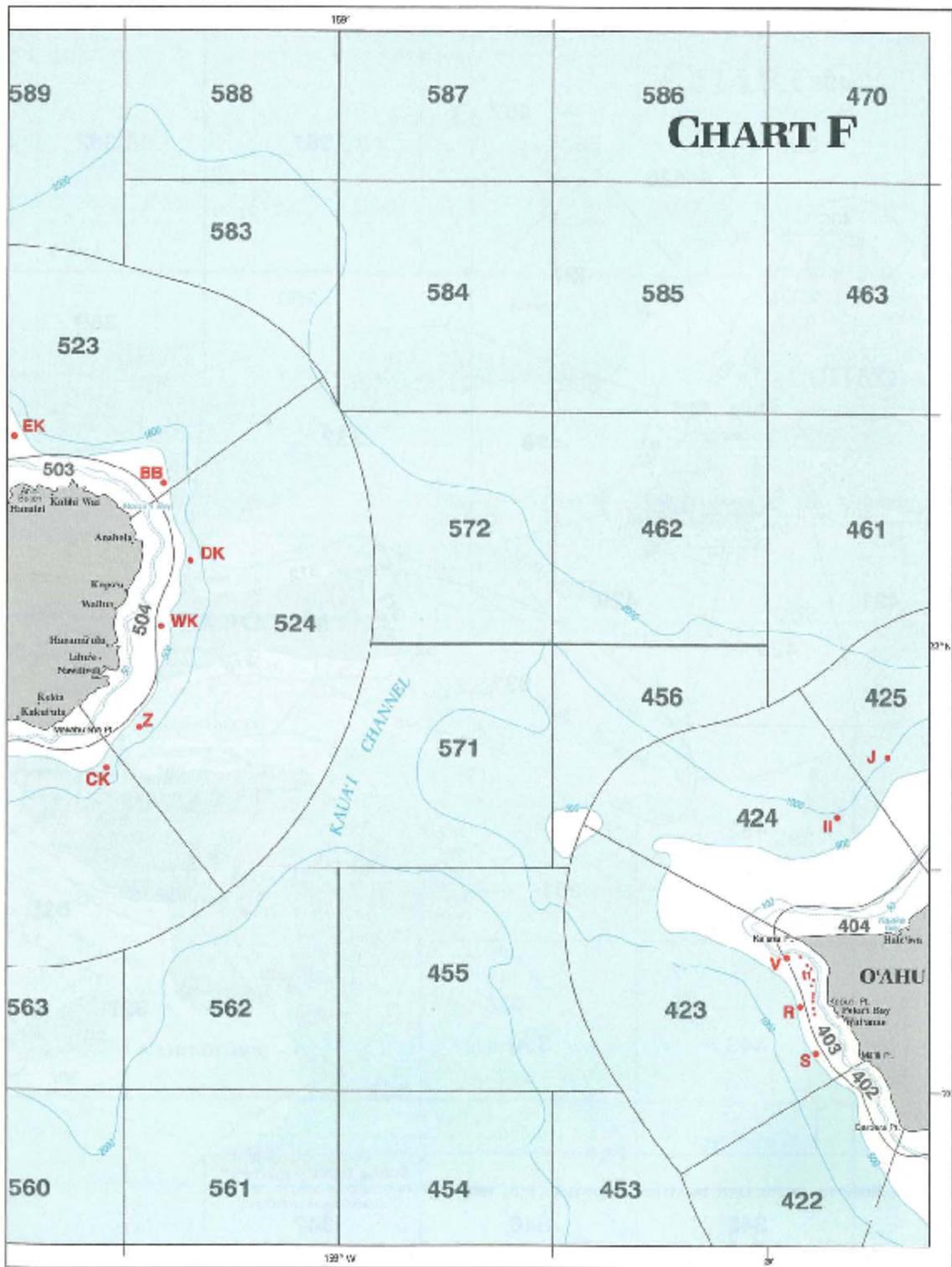




## **Appendix II.4s - Chart F**

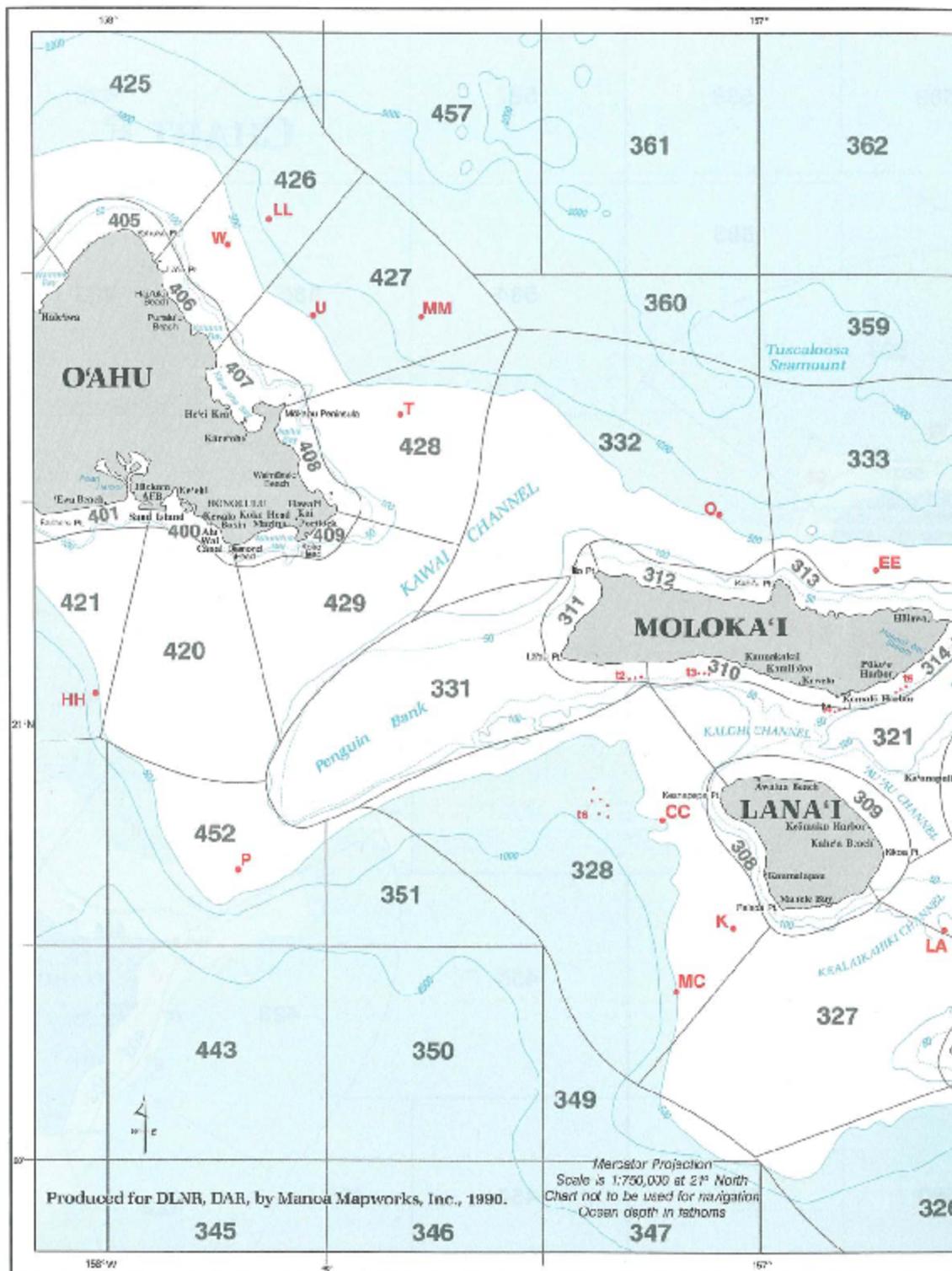
Description: The commercial fisheries statistical area charts were revised in April 1990. All of the areas in this chart are the original area codes established in 1948. The MHI area coverage extends from Kaula through leeward Oahu. The inshore areas extend 2 nautical miles from shore, and the offshore areas between extend from 2 through 20 nautical miles from shore.

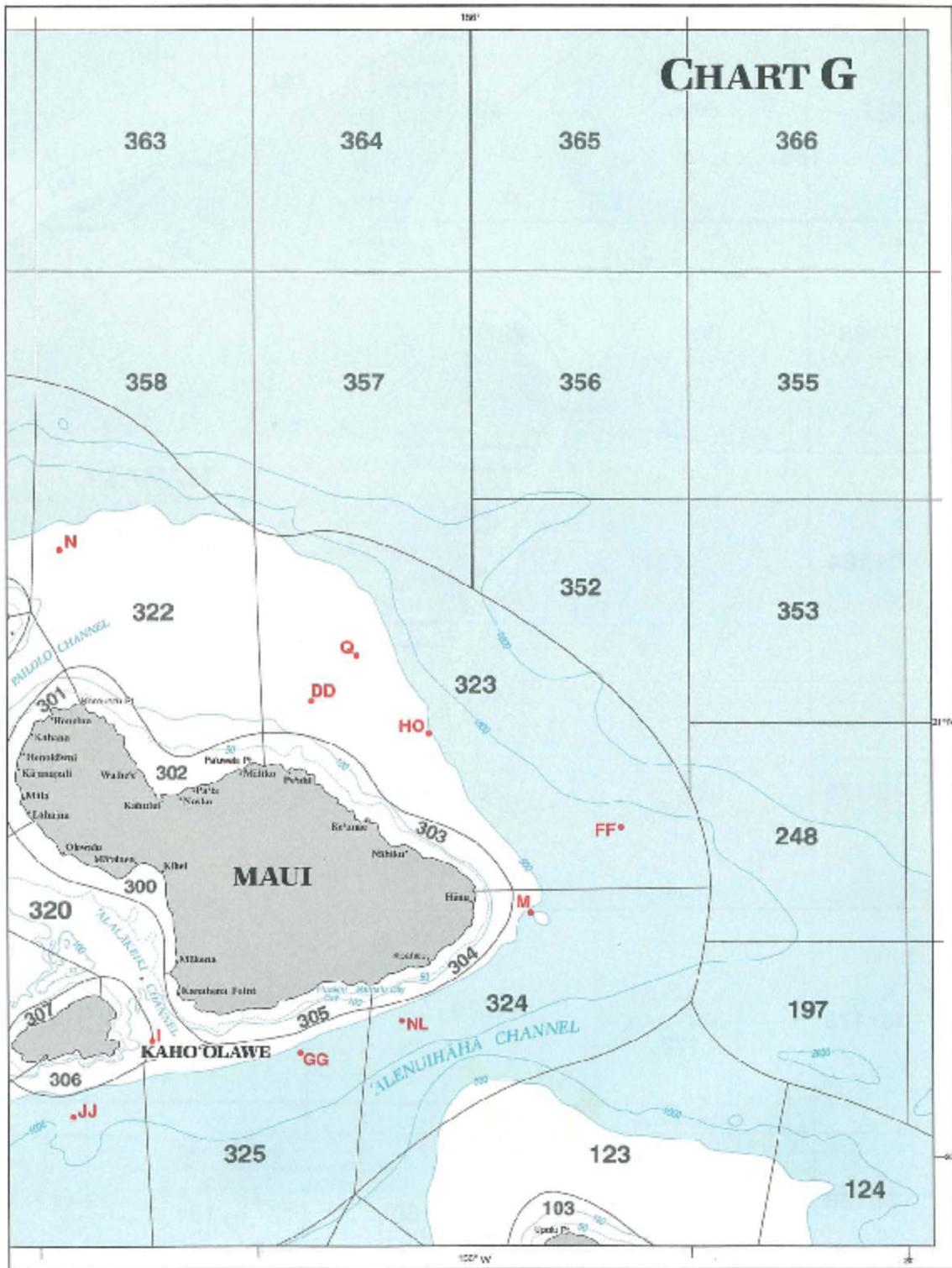




## **Appendix II.4t - Chart G**

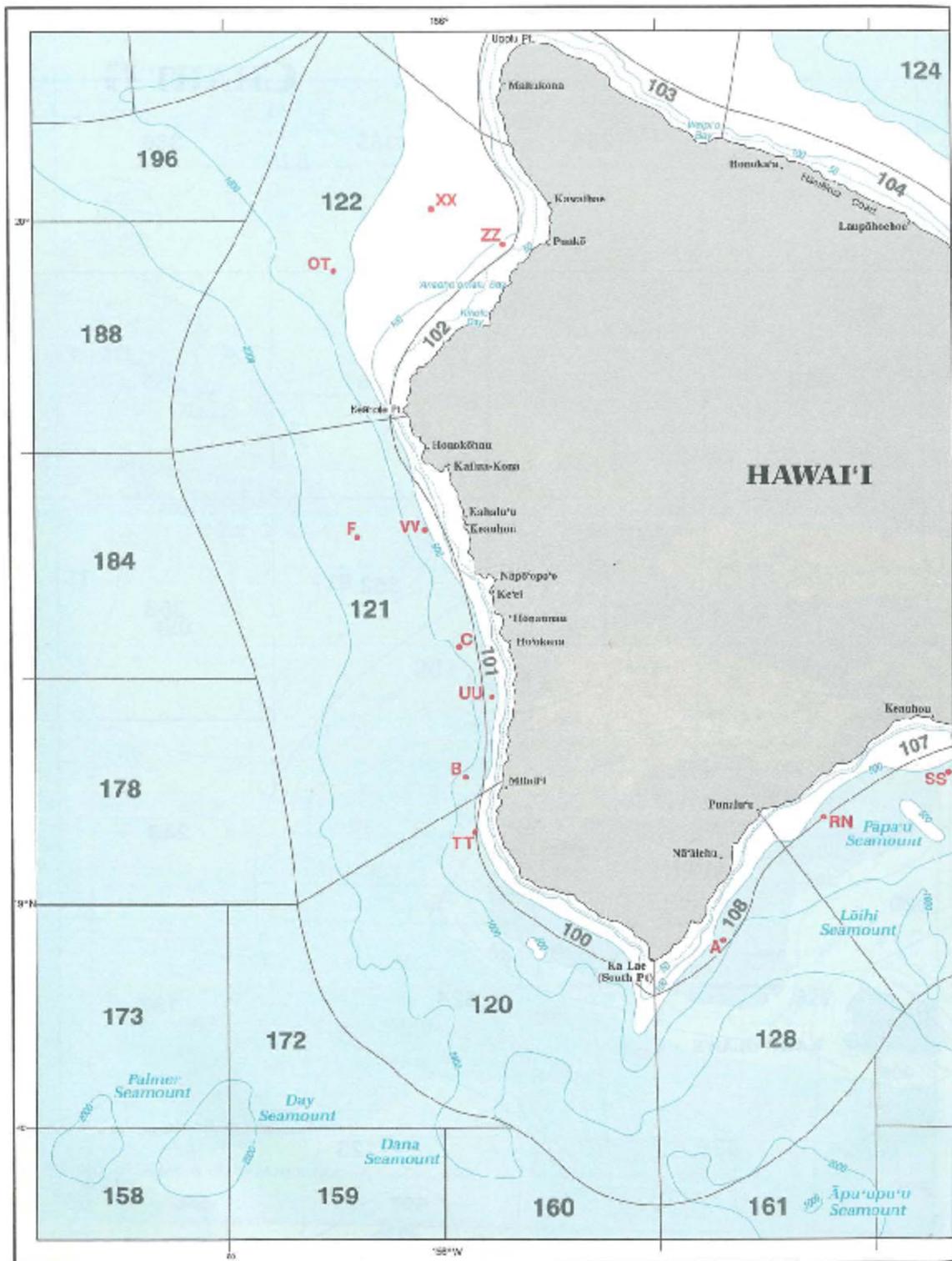
Description: The commercial fisheries statistical area charts were revised in April 1990. All of the areas in this chart are the original area codes established in 1948. The MHI area coverage extends from central Oahu through Maui. The inshore areas extend 2 nautical miles from shore, and the offshore areas between extend from 2 through 20 nautical miles from shore.

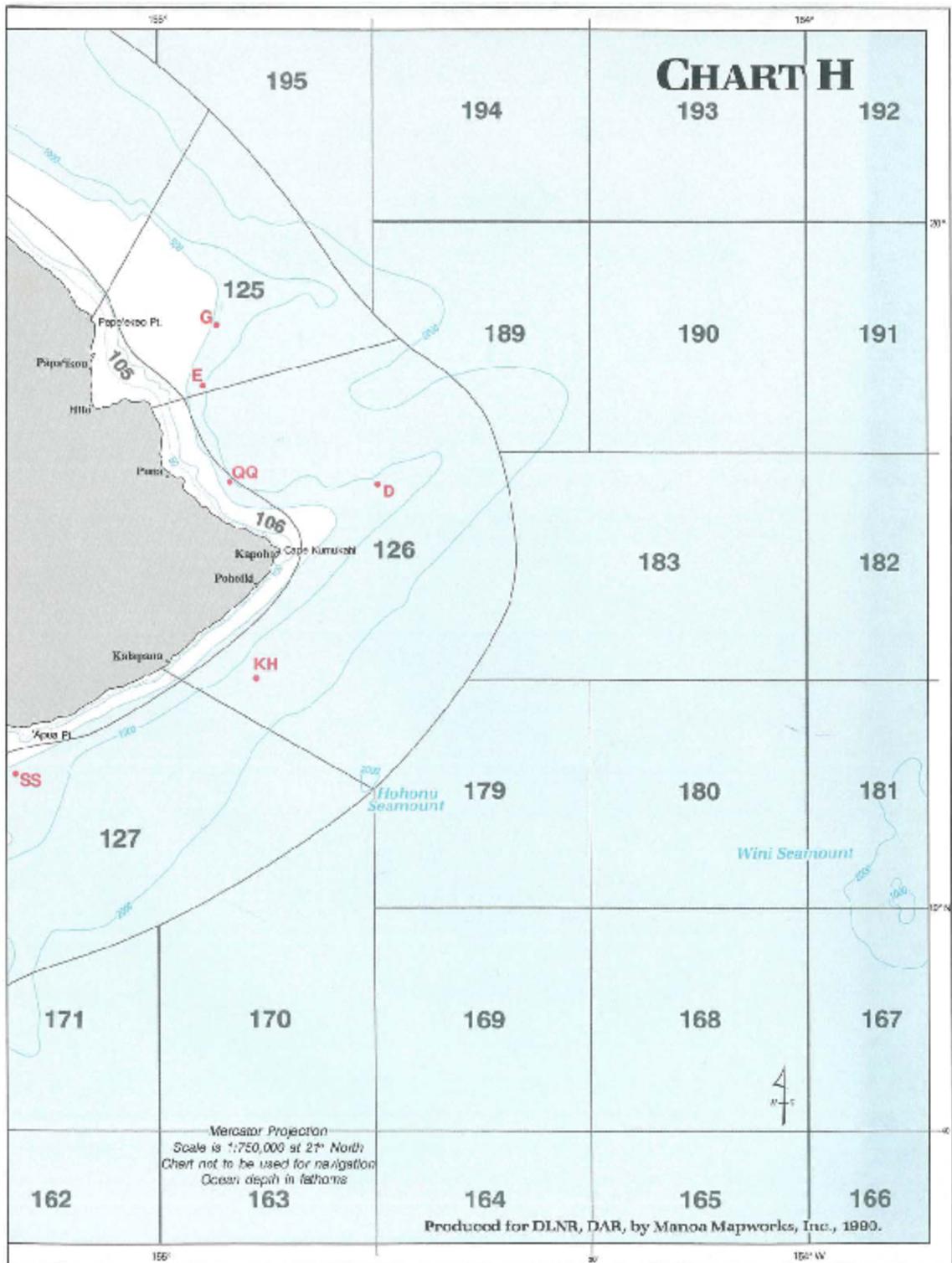




## **Appendix II.4u - Chart H**

Description: The commercial fisheries statistical area charts were revised in April 1990. All of the areas in this chart are the original area codes established in 1948. The MHI area coverage is for the Big Island of Hawaii. The inshore areas extend 2 nautical miles from shore, and the offshore areas between extend from 2 through 20 nautical miles from shore.





## Appendix II.4v – NWHI

Description: A separate commercial fisheries statistical area chart was developed for the NWHI probably during the 1950s. This set of area codes were four-digits and provides coverage from Nihoa through Hancock Bank. Each area covers one-degree square latitude and longitude, or 60 square nautical miles. This chart and all of the area codes were discontinued in April 1990 when the revised fisheries area charts were implemented. WPacFIN was provided with a matrix to convert the discontinued four-digit to the new five-digit area codes. In addition to the codes identified in the area chart, listed below in the Content section are other area codes.

Content:

<u>Area</u>	<u>Code</u>	<u>Code</u>	<u>Code</u>
Nihoa (inshore, offshore, mid-ocean)	1019	1039	1099
Necker (inshore, offshore, mid-ocean)	1119	1139	1199
French Frigate Shoals (inshore, offshore, mid-ocean)	1219	1239	1299
Brooks Bank (inshore, offshore, mid-ocean)	1319	1339	1399
St. Rogatien Banks (inshore, offshore, mid-ocean)	1419	1439	1499
Gardner Pinnacles (inshore, offshore, mid-ocean)	1519	1539	1599
Raita Banks (inshore, offshore, mid-ocean)	1619	1639	1699
Maro Reefs (inshore, offshore, mid-ocean)	1719	1739	1799
Laysan (inshore, offshore, mid-ocean)	1819	1839	1899
Lisianski (inshore, offshore, mid-ocean)	1919	1939	1999
Pearl & Hermes (inshore, offshore, mid-ocean)	2119	2139	2199



## Appendix II.4w - Other Far Offshore Areas

Description: A set of four-digit statistical area codes was established for several far offshore areas including the Northern Line Islands. The start date when the area codes were established is unknown. Most of these areas are not located on Chart A, which provides the broadest fishing area code coverage.

Content:

<u>Area</u>	<u>Code</u>	<u>Code</u>	<u>Code</u>
Palmyra Atoll (inshore, offshore, mid-ocean)	3019	3039	3099
Washington Island (inshore, offshore, mid-ocean)	3119	3139	3199
Fanning Island (inshore, offshore, mid-ocean)	3219	3239	3299
Christmas Island (inshore, offshore, mid-ocean)	3319	3339	3399
North of Midway	7777		

**Appendix II.4x**  
**Fish Aggregation Device Codes**

<u>Island</u>	<u>FAD</u>	<u>Area code</u>	<u>Location</u>	<u>Estab.</u>	<u>Discont.</u>
<b>State maintained FADs:</b>					
Hawaii	<b>A</b>	108, 128	Pahala	1980	
Hawaii	<b>B</b>	121	Milolii	1980	
Hawaii	<b>C</b>	121	Loa Pt.	1985	
Hawaii	<b>D</b>	126	Kumukahi	1982	
Hawaii	<b>E</b>	125, 126	Lelewi	1984	
Hawaii	<b>F</b>	121	Kailua-Kona	1983	
Hawaii	<b>G</b>	125	Pepeekeo	1982	
Hawaii	<b>H</b>	122	Kawaihae	1983	1984
Hawaii	<b>HK</b>	125	Hakalau	2000	
Hawaii	<b>KH</b>	126	Kehena	1989	
Hawaii	<b>OT</b>	122	Waikoloa, (OTEC)	1987	
Hawaii	<b>QQ</b>	106, 126	Makuu	1985	
Hawaii	<b>RN</b>	107, 127	Palima Pt.	1989	
Hawaii	<b>SS</b>	127	Apua Pt.	1985	
Hawaii	<b>TT</b>	100, 120	Kanewaa Pt.	1985	
Hawaii	<b>UU</b>	101, 121	Auau Pt.	1985	
Hawaii	<b>VV</b>	101, 121	Kahaluu	1985	
Hawaii	<b>WW</b>	121	Keahole Pt.	1985	1989
Hawaii	<b>XX</b>	122	Puako	1985	
Hawaii	<b>YY</b>	122	Waima Pt.	1985	1988
Hawaii	<b>ZZ</b>	102, 122	Waima Pt.	1983	
Kahoolawe	<b>I</b>	306, 320	Halona Pt.	1980	
Kahoolawe	<b>JJ</b>	326	Kamohio	1989	
Kauai	<b>AA</b>	520	Port Allen	1980	
Kauai	<b>BB</b>	523, 524	Molooa	1980	

<u>Island</u>	<u>FAD</u>	<u>Area code</u>	<u>Location</u>	<u>Estab.</u>	<u>Discont.</u>
Kauai	<b>CK</b>	520	Makahueana Pt.	1985	
Kauai	<b>DK</b>	524	Anahola	1985	
Kauai	<b>EK</b>	523	Hanalei	1985	
Kauai	<b>KK</b>	520, 521	Waimea	1990	
Kauai	<b>PP</b>	520	Koloa	1985	
Kauai	<b>WK</b>	504, 524	Waialua	1988	
Kauai	<b>Z</b>	524	Kipukai	1983	
Lanai	<b>CC</b>	328	Kaena Pt.	1985	
Lanai	<b>K</b>	328	Palaoa	1980	
Lanai	<b>MC</b>	328	Palaoa	1989	
Lanai	<b>T6</b>	328	Lanai (mid-water FADs)	1991	
Maui	<b>DD</b>	323	Opana Pt.	1985	
Maui	<b>FF</b>	323	Pukaulua Pt.	1985	
Maui	<b>GG</b>	325	Nakaohu Pt.	1985	1994
Maui	<b>HO</b>	323	Hoolawa Pt.	1989	
Maui	<b>LA</b>	320, 327	Lahaina	1989	
Maui	<b>M</b>	324	Hana Bay	1980	
Maui	<b>NL</b>	324	Nuu Landing	1989	
Maui	<b>Q1</b>	323	Pauwela Pt.	1982	
Molokai	<b>EE</b>	333	Kikipua Pt.	1985	1993
Molokai	<b>L</b>	328	Kaunakakai	1983	1983
Molokai	<b>N</b>	322	Cape Halawa	1980	
Molokai	<b>O</b>	332	Kalaupapa	1980	
Molokai	<b>T2</b>	311, 331	Kolo Harbor (mid-water)	1989	
Molokai	<b>T3</b>	310	Palaa (mid-water)	1989	
Molokai	<b>T4</b>	310, 321	Kamalo Har. (mid-water)	1989	
Molokai	<b>T5</b>	314	Pukoo (mid-water)	1989	
Oahu	<b>BO</b>	421, 422	Barbers Pt.	1992	
Oahu	<b>CO</b>	423	Kaena Pt.	1991	
Oahu	<b>HH</b>	421	Pearl Harbor	1985	

<u>Island</u>	<u>FAD</u>	<u>Area code</u>	<u>Location</u>	<u>Estab.</u>	<u>Discont.</u>
Oahu	<b>II</b>	424	Haleiwa	1985	
Oahu	<b>J</b>	425	Waialeale	1985	
Oahu	<b>LL</b>	426	Hauula	1985	
Oahu	<b>MM</b>	427	Mokapu Pt.	1985	
Oahu	<b>NN</b>	428	Waimanalo	1985	1992
Oahu	<b>P</b>	452	Penguin Bank	1983	
Oahu	<b>Q</b>	331	Penguin Bank	1980	1982
Oahu	<b>R</b>	423	Makaha	1983	
Oahu	<b>S</b>	423	Pokai Bay	1983	
Oahu	<b>T</b>	428	Makapuu	1983	
Oahu	<b>TA</b>	403	Makaha (mid-water)	1987	
Oahu	<b>T1</b>	403	Same FAD as 'TA'	1987	
Oahu	<b>U</b>	427	Kaneohe	1983	
Oahu	<b>V</b>	403, 423	Makua	1983	
Oahu	<b>W</b>	426	Laie	1983	1994
Oahu	<b>X</b>	425	Kuilima	1983	

<u>Island</u>	<u>FAD</u>	<u>Area code</u>	<u>Location</u>	<u>Estab.</u>	<u>Discont.</u>
<b>Non-State FADs:</b>					
Weather	<b>WE</b>	123	Federal weather buoy	1989	1993
Weather	<b>W1</b>	16223	NOAA 51001	1991	
Weather	<b>W2</b>	15717	NOAA 51002	1991	
Weather	<b>W3</b>	16019	NOAA 51003	1991	
Weather	<b>W4</b>	15217	NOAA 51004	1991	
Weather	<b>W6</b>	333	NOAA 51006	1993	1996
Weather	<b>W7</b>	327, 328	NOAA 51027	1994	1996
Other	<b>FB</b>	540	Federal oceanographic mooring	2000	2001
Other	<b>FH</b>	469	Federal oceanographic mooring	1998	
Other	<b>FI</b>	121	Kailua-Kona, private 'fishing island'	1989	1990
Other	<b>MO</b>	328	Federal NASA oceanographic mooring	1994	
Other	<b>NT</b>	320, 300	USN tracking buoy	1995	

## Appendix II.4y FADs by Island

### HAWAII ISLAND FISH AGGREGATING DEVICE SITES DLNR-Division of Aquatic Resources (6/14/07)

Location	ID	Buoy Coordinates	Landmark	Magnetic Heading to Buoy (Degrees)	nMiles to Buoy (approx)	Approx Depth (fathoms)
Ka Lae (South Pt.)	A	18.57.35N	Ka Lae (South Pt.)	60.0	7.9	700
		155-33.4W	Lae o Kamilo (Kamilo Pt.)	95.0	3.0	
Miloīī	B	19-11.9N	Miloīī Lt.	266.9	2.3	850
		155-56.9W	'Au'au Pt.	197.0	7.2	
			Kānewa'a Pt.	331.5	5.1	
Lae Loa (Loa Pt.)	C	19-23.1N	Kealakekua Bay Lt.	202.0	6.0	969
		155-59.2W	Lae Loa (Loa Pt.)	257.0	4.6	
			Miloīī	330.0	13.2	
Kumukahi	D	19-37.5N	Cape Kumukahi Lighthouse	41.5	11.4	950
		154-46.7W	Kaloli Pt.	79.0	16.7	
			Lelewi Pt.	96.0	20.7	
Lele'iwi	E	19-46.1N	Cape Kumukahi Lighthouse	324.0	16.5	920
		154-54.8W	Hilo Bay Breakwall Lt.	71.0	8.7	
			Lelewi Pt.	53.0	4.7	
			Pepe'ekeo Pt. Lt.	110.0	10.3	
Kailua-Kona	F	19-30.4N	Kailua Bay Lt.	230.0	10.1	1592
		156-09.4W	Keauhou Bay Lt.	258.0	11.5	
			Captain Cook	281.0	14.0	
Pepe'ekeo	G	19-50.7N	Cape Kumukahi Lighthouse	338.0	22.5	578
		154-53.3W	Pepe'ekeo Pt. Lt.	68.0	11.5	
			Hilo Bay Breakwall Lt.	41.0	14.1	
			Lelewi Pt.	26.0	11.5	
Hakalau	HK	19-58.64N	Hilo Bay Breakwall Lt.	4.0	15.0	890
		154-59.0W	Lelewi Pt.	253.0	14.7	
			Pepe'ekeo Pt. Lt.	25.0	10.0	
Kehena	KH	19-20.9N	Poho'iki Lt.	187.0	7.4	940
		154-52.8W	Hakuma Pt.	90.0	5.4	
Waikoloa	OTEC	19-52.6N	Kawaihae Lt.	234.0	23.0	714
		156-11.6W	Māhukona	212.0	25.0	
			Ke'ōhole Pt. Lt.	312.0	11.8	
Maku'u	QQ	19-39.2N	Lelewi Pt.	127.0	8.3	950
		154-53.5W	Cape Kumukahi Lighthouse	314.0	8.5	
Pālima Pt.	RN	19-07.8N	'Āpuā Pt.	225.0	13.7	733
		155-23.5W	Nīnole Cove	77.3	7.0	
'Āpuā Pt.	SS	19-11.6N	'Āpuā Pt.	188.0	4.1	515
		155-13.1W	Keauhou Bay Lt.	159.1	4.4	
Kānewa'a Pt.	TT	19-04.6N	Miloīī Lt.	202.1	4.6	700
		155-57.4W	Kaunā Pt.	312.0	6.3	
'Au'au Pt.	UU	19-16.8N	Kealakekua Bay Lt.	164.0	12.2	650
		155-57.1W	Miloīī Lt.	341.9	5.5	
Kahalu'u	VV	19-35.1N	Kailua Bay Lt.	193.5	3.8	600
		156-01.9W	Keauhou Bay Lt.	274.5	4.0	
Puakō	XX	20-01.4N	Māhukona Lt.	203.5	11.7	345
		156-01.3W	Kawaihae Lt.	255.0	10.8	
			Ke'ōhole Pt. Lt.	356.7	17.7	
Waimā Pt.	ZZ	19-56.9N	Hou Pt.	324.0	5.0	214
		155-57.7W	Waimā Pt.	250.0	6.2	
			Kawaihae Lt.	224.0	9.2	

*For current information or to report a missing FAD contact Warren Cortez, at the Hawaii Institute of Marine Biology, 808-848-2939 or visit website [www.hawaii.edu/HIMB/FADS](http://www.hawaii.edu/HIMB/FADS). You can also call the Division of Aquatic Resources at 808-587-0100 (Honolulu), 808-327-6226 (Kona) or 808-974-6201 (Hilo).*

**MAUI COUNTY FISH AGGREGATING DEVICE SITES**  
DLNR-Division of Aquatic Resources (8/2007)

<u>Location</u>	<u>ID</u>	<u>Buoy Coordinates</u>	<u>Landmark</u>	<u>Magnetic Heading to Buoy (Degrees)</u>	<u>nMiles to Buoy (approx)</u>	<u>Approx Depth (fathoms)</u>
<b><u>KAHOOLAWE</u></b>						
Hālonā	I	20-28.7N	Kākā Pt.	110.0	4.0	500
		156-29.3W	Waikahalulu Bay Lt.	88.0	10.5	
			Molokini	164.4	9.3	
Kamōhio	JJ	20-24.2N	Kākā Pt.	203.9	8.0	900
		156-38.0W	Waikahalulu Bay Lt.	149.6	6.6	
Keolaikahiki	SO	20-29.8N	Kealaikahiki Pt.	255.0	5.0	110
		156-46.9W				
<b><u>LĀNAI</u></b>						
Palaoa	K	20-40.1N	Palaoa Pt. Lt.	233.0	5.5	31
		157-02.6W	Ke'anapapa Pt.	165.0	12.6	
Palaoa	MC	20-35.9N	Ke'anapapa Pt.	182.0	18.3	575
		157-08.5W	Palaoa Pt. Lt.	217.0	12.8	
			Mānele Bay Lt.	226.0	16.7	
<b><u>MAUI</u></b>						
'Ōpana Pt.	DD	21-02.1N	Nākālele Pt. Lt.	78.0	19.1	203
		156-15.4W	Kahului Bay Lt.	45.5	14.8	
			Pa'uwela Pt. Lt.	25.0	6.5	
			'Ōpiko'ula Pt.	313.0	15.6	
Pukaulua Pt.	FF	20-50.12N	'Ōpiko'ula Pt.	73.0	13.5	828
		155-43.9W	Hāna Bay Lt.	43.0	9.3	
Ho'olawa Pt.	HO	20-56.4N	Pa'uwela Pt. Lt.	71.0	15.2	550
		156-00.8W	Ke'anae Pt.	26.0	9.0	
			Pukaulua Pt.	335.0	11.8	
Hālonā	HS	20-29.5N	Apole Pt.	204.0	9.7	650
		156-16.04W	Naka'ohu Pt.	174.0	6.4	
			La Pérouse Lt.	112.5	10.0	
Lahaina	LA	20-41.0N	Lahaina Lt.	178.0	11.5	110
		156-42.5W	McGregor Pt. Lt.	230.0	12.0	
			Molokini	273.8	12.3	
			Mānele Bay Lt. (Lanai)	99.0	10.8	
Hāna Bay	M	20-44.9N 155-50.5W	Hāna Bay Lt.	85.0	8.0	700
Nu'u Landing	NL	20-32.9N	Apole Pt.	152.0	4.4	664
		156-09.5W	Naka'ohu Pt.	104.0	7.0	
			Puhilele Pt.	212.0	8.4	
Pa'uwela Pt.	Q	21-08.5N	Nākālele Pt. Lt.	69.0	23.0	907
		156-07.7W	Kahului Bay Lt.	47.0	19.5	
			Pa'uwela Pt. Lt.	30.0	12.0	
			Nānu'alele Pt. Lt.	320.0	23.1	
<b><u>MOLOKA'I</u></b>						
Kolo Harbor	CC	21-02.1N	La'au Pt.	120.0	6.7	110
		157-13.0W	Kaunakakai	246.0	10.5	
Cape Hālawā (Lamaloa Head)	N	21-20.9N	Cape Hālawā	21.0	14.3	940
		156-35.0W	Kalaupapa Penn. Lt.	59.0	25.0	
			Nākālele Pt. Lt.	35.1	20.5	
Kalaupapa	O	21-18.2N	Kalaupapa Penn. Lt.	309.0	8.0	600
		157-02.8W	'Ilio Pt.	57.5	11.7	

*For current information or to report a missing FAD contact Warren Cortez, Hawaii Institute of Marine Biology, 808-848-2939 or visit website [www.hawaii.edu/HIMB/FADS](http://www.hawaii.edu/HIMB/FADS). You can also call the Division of Aquatic Resources at 808-587-0100 (Honolulu), 808-243-5295 (Maui) or 808-553-3778 (Molokai).*

OAHU FISH AGGREGATING DEVICE SITES  
DLNR-Division of Aquatic Resources (6/14/07)

Location	ID	Buoy Coordinates	Landmark	Magnetic Heading to Buoy (Degrees)	nMiles to Buoy (approx)	Approx Depth (fathoms)
Barbers Point	BO	21-09.9N 158-09.1W	Pōkaʻī Bay Lt.	161.0	16.7	850
			Honolulu Hbr. Buoy Lt.	233.0	16.4	
			Barbers Pt. Lt.	185.0	8.5	
Ka'ena Point	CO	21-33.7N 158-26.8W	Ka'ena Pt. Lt.	259.0	10.0	1010
			Pōkaʻī Bay Lt.	286.1	15.7	
Pearl Harbor	HH	21-02.1N 158-02.1W	Diamond Head Lt.	213.0	17.0	647
			Honolulu Hbr. Buoy Lt.	199.0	16.6	
			Barbers Pt. Lt.	154.0	16.2	
Hale'iwa	II	21-44.8N 158-13.3W	Ka'ena Pt. Lt.	5.0	11.1	985
			Hale'iwa Channel Buoy Lt.	314.0	10.7	
			Kahuku Pt.	267.5	13.4	
Waiale'e	J	21-50.0N 158-08.8W	Ka'ena Pt. Lt.	11.0	16.9	960
			Hale'iwa Channel Buoy Lt.	341.5	13.5	
			Kahuku Pt.	296.5	11.5	
Hau'ula	LL	21-44.9N 157-45.3W	Kahuku Pt.	67.7	12.7	1140
			Lā'ie Pt.	44.0	10.5	
			Pyramid Rock	350.0	17.2	
Mōkapu Point	MM	21-36.4N 157-31.2W	Pyramid Rock	45.0	15.0	1355
			Makapu'u Pt. Lt.	7.5	18.0	
Penguin Bank	P	20-46.4N 157-48.7W	Diamond Head Lt.	168.0	28.2	286
			Honolulu Hbr. Buoy Lt.	160.0	31.0	
			Lā'au Pt. Lt. (Molokaʻi)	223.5	34.5	
Mākaaha	R	21-27.5N 158-16.9W	Lahilahi Pt.	253.5	3.5	460
			Pōkaʻī Bay Lt.	268.0	4.9	
			Ka'ena Pt. Lt.	168.8	7.2	
Pōkaʻī Bay	S	21-23.8N 158-14.8W	Ka'ena Pt. Lt.	158.8	10.8	460
			Pōkaʻī Bay Lt.	214.0	4.2	
			Barbers Pt.	295.0	9.8	
Makapu'u	T	21-27.5N 157-33.6W	Mōkapu Pt.	80.0	9.3	365
			Makapu'u Pt. Lt.	18.9	10.1	
Kāne'ohe	U	21-34.9N 157-41.5W	Mokolīʻi Island	47.0	9.5	554
			Mōkapu Pt. Lt.	0.5	7.7	
Mākuā	V	21-32.3N 158-18.8W	Ka'ena Pt. Lt.	207.5	3.1	309
			Lahilahi Pt.	298.0	7.2	
Kahuku	X	21-51.8N 157-59.6W	Ka'ena Pt. Lt.	33.0	23.6	945
			Hale'iwa Channel Buoy Lt.	14.0	18.2	
			Lā'ie Pt.	330.5	13.3	

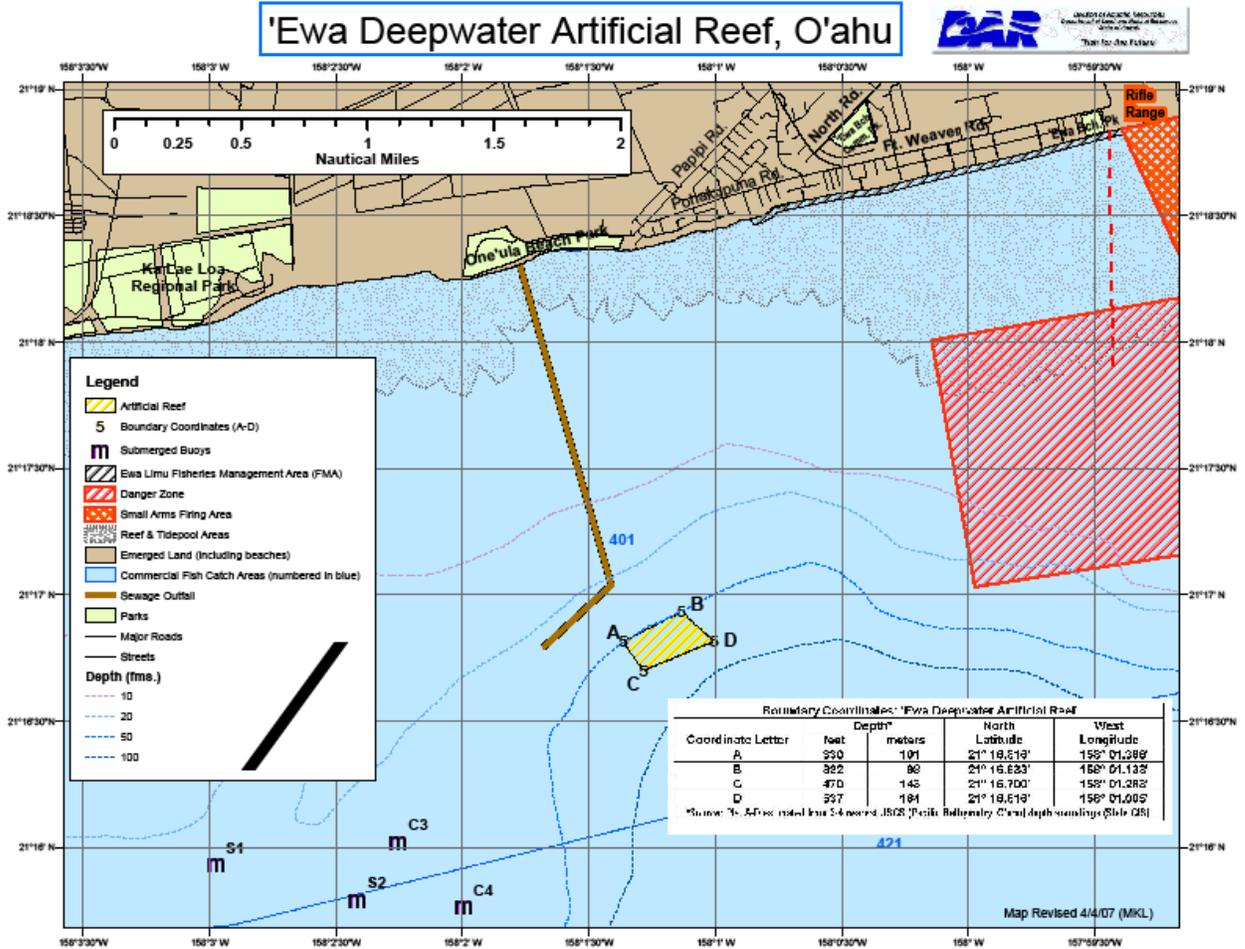
For current information or to report a missing FAD contact Warren Cortez, Hawaii Institute of Marine Biology, 808-848-2939 or visit website [www.hawaii.edu/HIMB/FADS](http://www.hawaii.edu/HIMB/FADS). You can also call the Division of Aquatic Resources at 808-587-0100 (Honolulu).

**KAUAI FISH AGGREGATING DEVICE SITES**  
DLNR-Division of Aquatic Resources (6/14/2007)

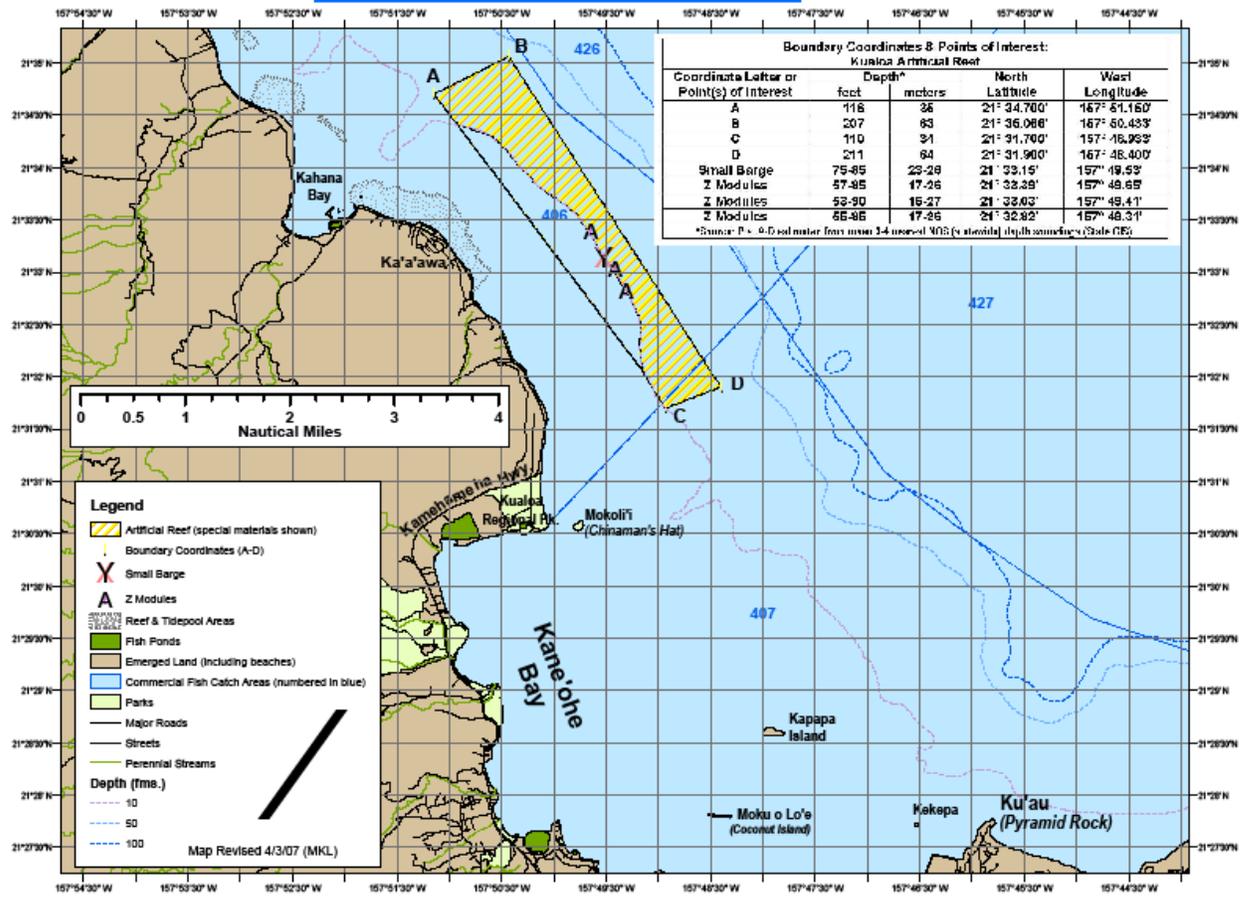
Location	ID	Buoy Coordinates	Landmark	Magnetic Heading to Buoy (Degrees)	nMiles to Buoy (approx)	Approx Depth (fathoms)
Port Allen	AA	21-49.3N 159-36.6W	Kokole Pt.	125.0	13.4	960
			Hanapepē Buoy Lt.	170.5	4.7	
			Makahū'ena Pt. Lt.	238.0	9.6	
Moloa'a	BB	22-13.6N 159-13.9W	Kīlauea Pt. Lt.	82.0	8.1	1000
			Kahala Pt. Lt.	15.0	5.1	
Makahū'ena Pt.	CK	21-48.4N 159-21.5W	Makahū'ena Pt.	130.0	5.8	825
			Ninini Pt.	182.0	10.2	
Anahola	DK	22-07.5N 159-13.7W	Kepuhi Pt.	119.0	9.0	700
			Kahala Pt. Lt.	105.0	4.3	
			Kamilo Pt.	19.5	10.8	
Hanalei	EK	22-19.6N 159-29.5W	Kīlauea Pt. Lt.	306.0	8.5	1000
			Kailiw Pt.	27.0	8.5	
			Hanalei Bay	358.0	8.5	
Waimea	KK	21-51.9N 159-43.9W	Kokole Pt.	162.0	7.0	960
			Waimea Channel Marker	207.0	6.0	
			Pū'olo Pt.	245.0	8.0	
Kōloa	PP	21-47.7N 159-34.2W	Makahū'ena Pt.	215.0	8.4	950
			Port Allen Lt.	146.8	7.8	
Waialua	WK	22-01.3N 159-12.9W	Kahala Pt. Lt.	142.5	9.0	915
			Ninini Pt.	50.0	7.5	
Kīpū Kai	Z	21-52.5N 159-18.5W	Makahū'ena Pt.	77.0	8.5	892
			Kawelikoā Pt.	101.0	5.2	
			Ninini Pt.	149.9	5.6	

*For current information or to report a missing FAD contact Warren Cortez, Hawaii Institute of Marine Biology, 808-848-2939 or visit website [www.hawaii.edu/HIMB/FADS](http://www.hawaii.edu/HIMB/FADS). You can also call the Division of Aquatic Resources at 808-587-0100 (Honolulu) or 808-274-3344 (Kauai).*

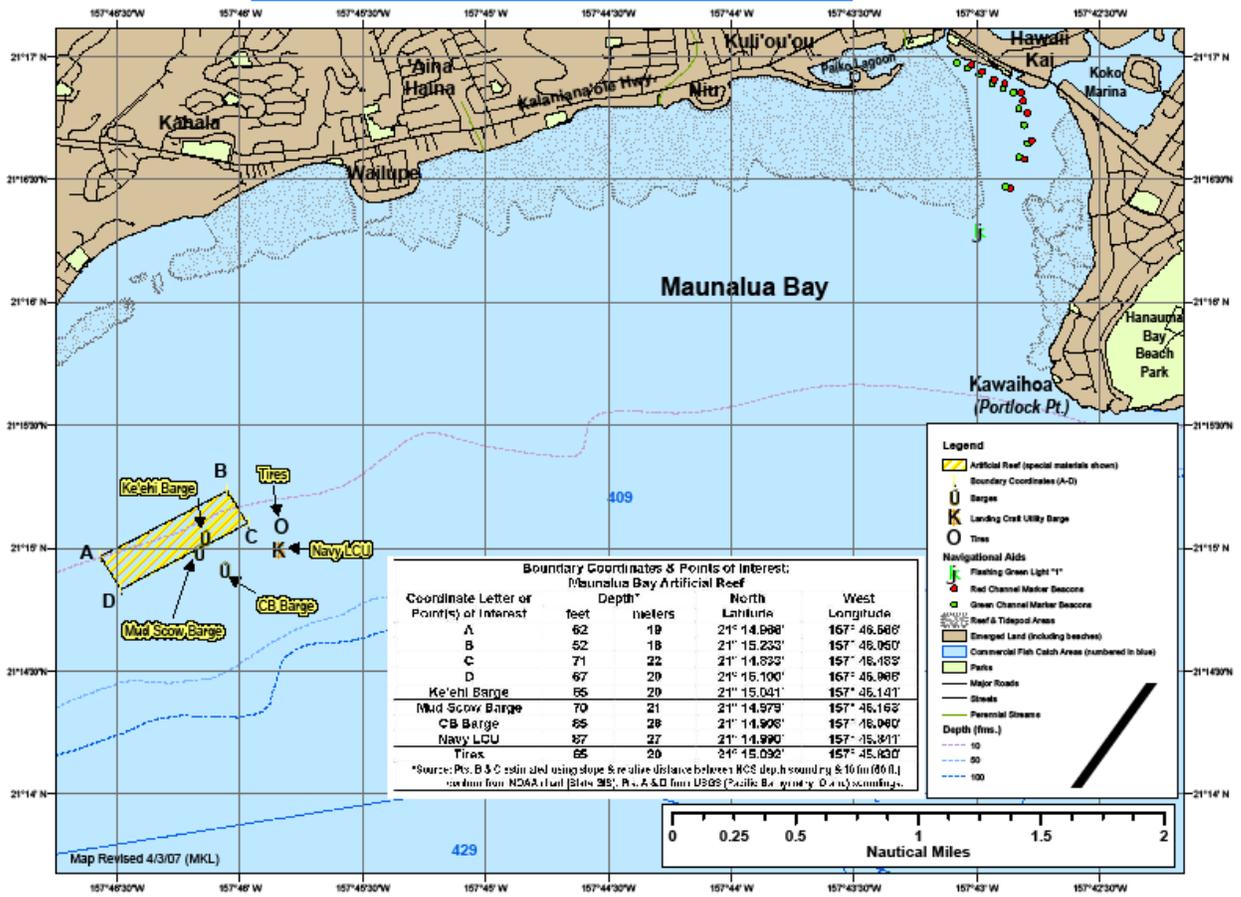
## Appendix II.4z Artificial Reefs by Island



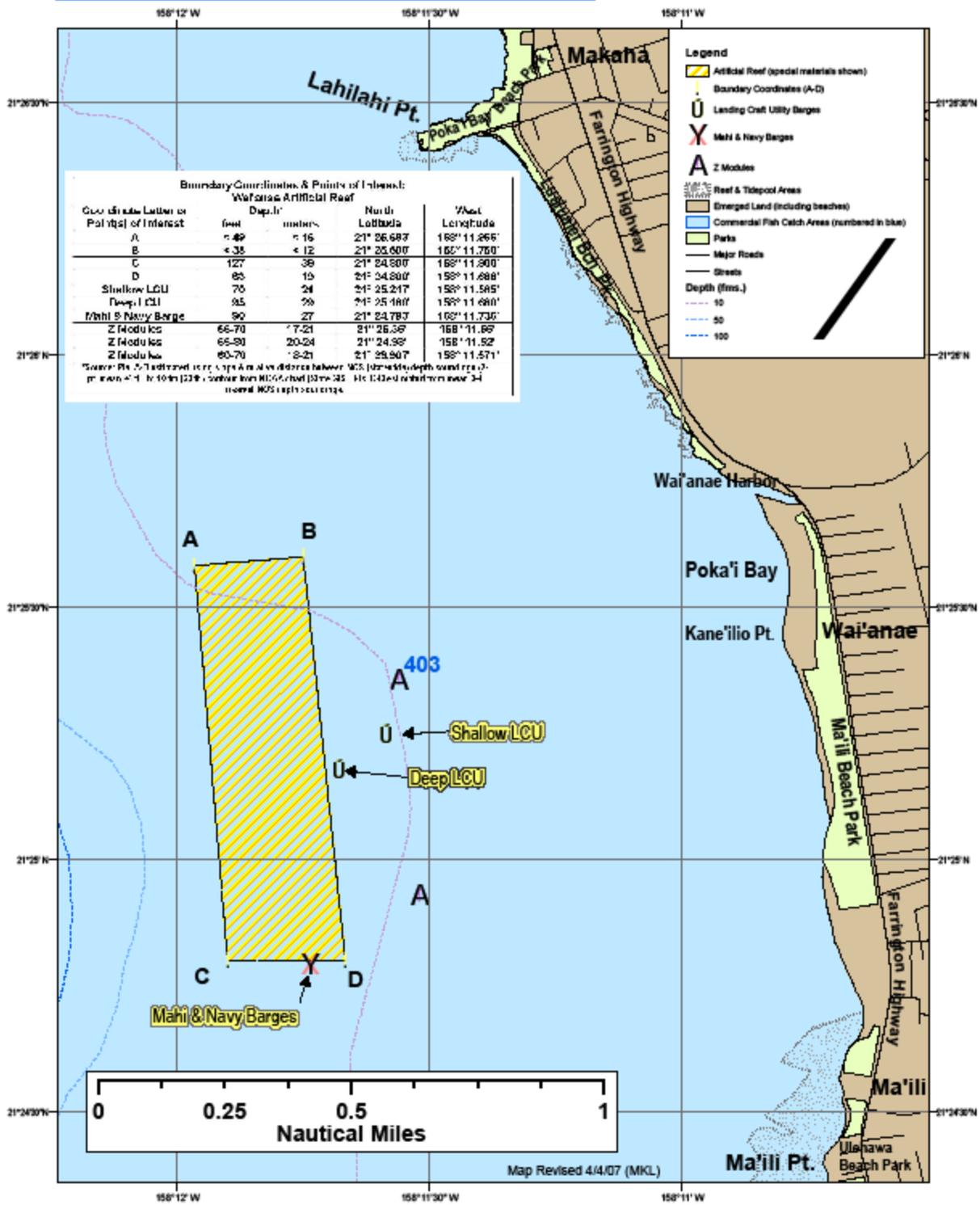
# Kualoa Artificial Reef, O'ahu



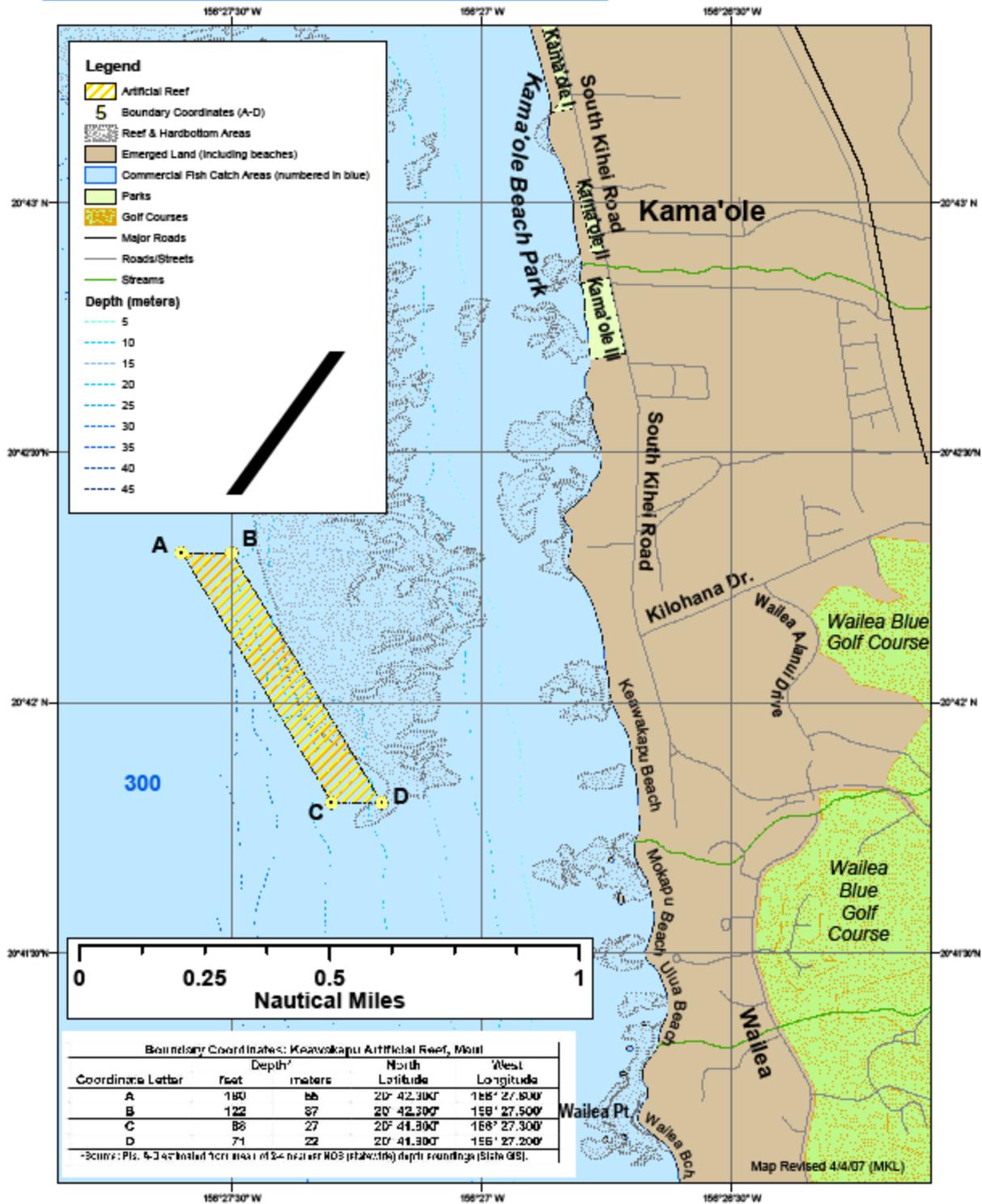
# Maunaloa Bay Artificial Reef, O'ahu



# Wai'anae Artificial Reef, O'ahu



# Keawakapu Artificial Reef, Maui



**Appendix II.5a**  
**Fish Dealer Report Data Record File Format**

Filename: **DEALERyyyy.dbf**  
 Usage: FDRS dealer data

<u>Field name</u>	<u>Type</u>	<u>Len./Dec.</u>	<u>Description</u>
<b>DLR_NO</b>	Num.	6	Fish dealer's tracking number
<b>REPORTDATE</b>	Date	8	Purchase date
<b>FNAME</b>	Char.	18	Licensee first name
<b>LNAME</b>	Char.	24	Licensee last name
<b>CML_NO</b>	Num.	6	Fisherman's commercial marine license number
<b>SPC</b>	Num.	4	Species code
<b>LBS</b>	Num.	9.2	Pounds bought
<b>PIECES</b>	Num.	6	Number of pieces bought
<b>VALUED</b>	Num.	10.2	Value of pounds bought
<b>PRICE</b>	Num.	6.2	Average price of pounds bought
<b>AVE_WGHT</b>	Num.	7.1	Average weight of pounds bought
<b>CONDITION</b>	Char.	35	Condition code or description of fish bought
<b>ORIGSPNAME</b>	Char.	25	Species name
<b>SYSDATETIM</b>	Date	8	System time stamp when record was last updated
<b>BOAT</b>	Char.	28	Vessel name
<b>CAPTAIN</b>	Char.	35	Vessel captain name
<b>F_LBS</b>	Logic	1	Flag for invalid lbs. - include flag for invalid pieces
<b>F_PRICE</b>	Logic	1	Flag for invalid price
<b>F_DATE</b>	Logic	1	Flag for invalid purchase date
<b>F_SPECIES</b>	Logic	1	Flag for invalid species code
<b>F_LICENSE</b>	Logic	1	Flag for invalid commercial marine license number
<b>F_VALUE</b>	Logic	1	Flag for invalid value of pounds bought
<b>F_UN SOLD</b>	Logic	1	Flag for invalid count for number unsold
<b>O_CML_NO</b>	Num.	6	Original commercial marine license number

<u>Field name</u>	<u>Type</u>	<u>Len./Dec.</u>	<u>Description</u>
<b>O_BOAT</b>	Char.	28	Original vessel name
<b>O_SPC</b>	Num.	4	Original species code
<b>ADJ_LBS</b>	Num.	8.1	Adjusted pounds bought





Field: **BOAT** Type: Alphanumeric Length: 28  
Description: This is the name of the fishing vessel used by a licensed fisherman who offered the catch for sale. Fishing vessel name is available for all dealer records submitted by the United Fishing Agency fish auction. Several years ago, Hilo Fish Company began providing the names of longline fishing vessels. WPacFIN and DAR determined that, in addition to the commercial marine license number, the vessel name is necessary to properly integrate and link fish report and fish dealer report records. Beginning in January 2008, all dealers were required to report vessel name for purchases of marine life from boat-based fisheries.

Field: **CAPTAIN** Type: Alphanumeric Length: 35  
Description: This is the name of the fishing vessel captain provided only by the United Fishing Agency fish auction.

Field: **F\_LBS** Type: Logical Length: 1  
Description: This is a flag field to indicate a discrepancy in pounds sold. The information could not be corrected through post-data validation procedures.

Field: **F\_PRICE** Type: Logical Length: 1  
Description: This is a flag field to indicate a discrepancy in the price range for the species bought. The information could not be corrected through post-data validation procedures.

Field: **F\_DATE** Type: Logical Length: 1  
Description: This is a flag field to indicate a discrepancy in the purchase date. The information could not be corrected through post-data validation procedures.

Field: **F\_SPECIES** Type: Logical Length: 1  
Description: This is a flag field to indicate that there is a discrepancy in the species code. The information could not be corrected through post-data validation procedures.

Field: **F\_LICENSE** Type: Logical Length: 1  
Description: This is a flag field to indicate that there is a discrepancy in the commercial marine license number of the fisher who sold the catch. The information could not be corrected through post-data validation procedures.



## Appendix III

### Basic Questions for Fisherman Interviews

Dear Fisherman

The greatest source of catch and effort information available to scientists for stock assessment purposes is the State of Hawaii catch reports you and other fishermen have filled out and submitted. They have good records back to 1948. Unfortunately for the stock assessment scientists several important questions were not asked on these forms. In order to track the abundance of fish over time the scientists need to calculate annual average catch rates (how much fish can be caught by each line in an hour), but the number of hours fished was not asked. In fact, even the number of days fished on an average trip was not asked. To further complicate the catch rate issue, technological changes over the last 50-60 years have greatly impacted a fisherman's ability to find and catch fish. What we are looking for by asking the following questions is your personal experience and opinion on how bottomfishing has changed over time. We would like to know how changes in the fishing equipment and techniques that you used improved your ability to catch fish. These improvements include the ability to bring back a larger catch on a single trip, but also time savings on a trip from shorter search times and from quicker turn-over of gear. The information you provide will be used to re-evaluate the time series of fisherman catch data and improve future stock assessments.

1. When did you start bottomfishing?
2. What type of gear did you use at that time?
  - a. Line and hooks
  - b. Line hauling (basket and hand line vs hydraulic or electric reel)
  - c. Navigation tools (line of sight vs Loran or GPS)
  - d. Bottom finding equipment (lead line vs sounder, etc.)
  - e. other
3. What fishing techniques did you usually use?
  - a. Anchor or drift
  - b. Number of lines fished
  - c. Palu bag
  - d. Day or night fishing
  - e. other
4. Did you move to locations in deeper water or further from shore as fish were depleted in your primary sites?
  - a. Was this a continual process going deeper and farther over time or did you alternate between several sites returning to old sites after allowing them to rest?

5. Did targeting of species or size change over time?
  - a. If so how and why. Was it due to market demand (e.g. larger fish for restaurant trade vs smaller for home consumption) or was it due to availability of fish of a certain size?
  
6. What was your average trip length?
  - a. Did average trip length change over time?
  - b. If so by how much and why?
  
7. On the following list please fill in the year you started using the technology and your feeling on how it improved your ability to find and or catch of fish. Please include any that you feel are important but not listed here. Examples:

	<u>Technology</u>	<u>Year</u>	<u>Time savings</u>
A	Hydraulic reel vs basket and hand hauling	1976	20 min vs 30 min hauling time
B	Loran vs landmarks	1963	1 hour vs 3 hours search time

1. Hydraulics for anchoring (time savings on a trip)
2. Hydraulic line haulers
3. Electric reels
4. Loran
5. GPS
6. Depth Sounder
7. Chromoscope
8. Others