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EAST HAWAII COMMERCIAL FISHING MOORING AND LAUNCHING FACILITY PROJECT

-- Economic and Resource Analysis --

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EAST HAWAII COMMERCIAL FISHING

MOORING AND LAUNCHING FACILITY PROJECT

--ECONOMIC AND RESOURCE ANALYSIS--

Revised Final Report

Honolulu Laboratory
National Marine Fisheries Service
2570 Dole Street
Honolulu, Hawaii 96822

March 1986
(partially revised, August 1988)

Preface

This report initially was prepared by the Honolulu Laboratory, National Marine Fisheries Service (NMFS), for the U.S. Army Engineer Division, Pacific Ocean (Corps). This report is an edited version of the earlier report (March 1986) prepared for the Corps. There are a number of quantitative changes in this version, occasioned by corrections, but substantively the two versions differ only slightly. Pagination and table numbers also change from the original Corps report.

Although the technical assessment was conducted by NMFS staff, the findings, opinions, and recommendations contained herein do not reflect an NMFS policy regarding the proposed Corps project. This report does not address engineering problems, transportation policy, or environmental and social impacts of the proposed project. Evaluation of these impacts is the province of the Corps.

The data for this report come from four primary sources:

1) NMFS vessel inventory (1983).

2) Hawaii Division of Aquatic Resources (HDAR) commercial fishing landings records: (1970 through June 1984).

3) NMFS cost-earning survey (1982).

4) Corps survey of fishing vessel owners on the Island of Hawaii (1985) and the Corps' Hilo Area Comprehensive Study (1980).

Data are reported in pounds; the metric conversion is 2.2 lb. per kilo and 2,205 lb. per metric ton.

The HDAR was extremely helpful in providing preliminary summary reports on recent commercial landings. Any shortcomings in data interpretation are the responsibility of NMFS.

The NMFS Honolulu Laboratory staff responsible for this report were: Samuel G. Pooley, industry economist; Jim Baxter, computer assistant; and Wesley K. Higuchi, mathematics aid.

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East Hawaii Commercial Fishing Mooring and/or Launching Facility Project

--Economic and Resource Analysis--

PART 1. BACKGROUND ANALYSIS

I. Introduction

The objective of this report is to analyze the potential benefits from alternative mooring and launching facilities for commercial fishing vessels in the Cape Kumukahi-Pohoiki area on the eastern shore of the Island of Hawaii, just south of Hilo.

Because the Island of Hawaii carries the same name as the State, the locally used term "Big Island" will be used throughout this report to refer to the island while the term "Hawaii" will refer to the state unless made clear to the contrary. "East Hawaii" also refers to the project area. Figure 1 is a map of the project area.

Cost-benefit analysis of capital construction projects is typically conducted by comparing the conditions which would pertain "Without" the project (i.e., the status quo) to those "With" various alternative projects (cf., Hufschmidt 1983). This report is also based on material presented by the Corps in their original Cape Kumukahi project proposal (Corps 1984).

The "Without" project situation consists of an existing small mooring facility in Hilo Bay (Wailoa River) with its two-lane ramp for trailered vessels and a one-lane ramp at Pohoiki, south of Hilo.

There are three "With" project alternatives:

1) An improved launching ramp for trailered vessels with offloading facilities for moored vessels at Pohoiki or Cape Kumukahi, on east Hawaii; or,

2) A light draft harbor to be built at Cape Kumukahi or at Pohoiki; or,

3) A light draft harbor to be built in Hilo Bay.

The particular benefits which might accrue from building facilities at Cape Kumukahi or Pohoiki arise from the relative proximity of these sites to prime fishing areas on the east side of Hawaii. These are cost minimizing (from reduced travel time) and revenue enhancing benefits (from increased fishing time and reduced storage and handling time).

Benefits from all three alternatives would increase over the baseline projections with long-term growth of the commercial fishing fleet in east Hawaii. The existing launching ramp at Pohoiki is essentially fully utilized, thus reducing the scope for additional trailered-vessel fishing effort south of Hilo. The existing moorage facility at Hilo is also somewhat limited and is located inconveniently

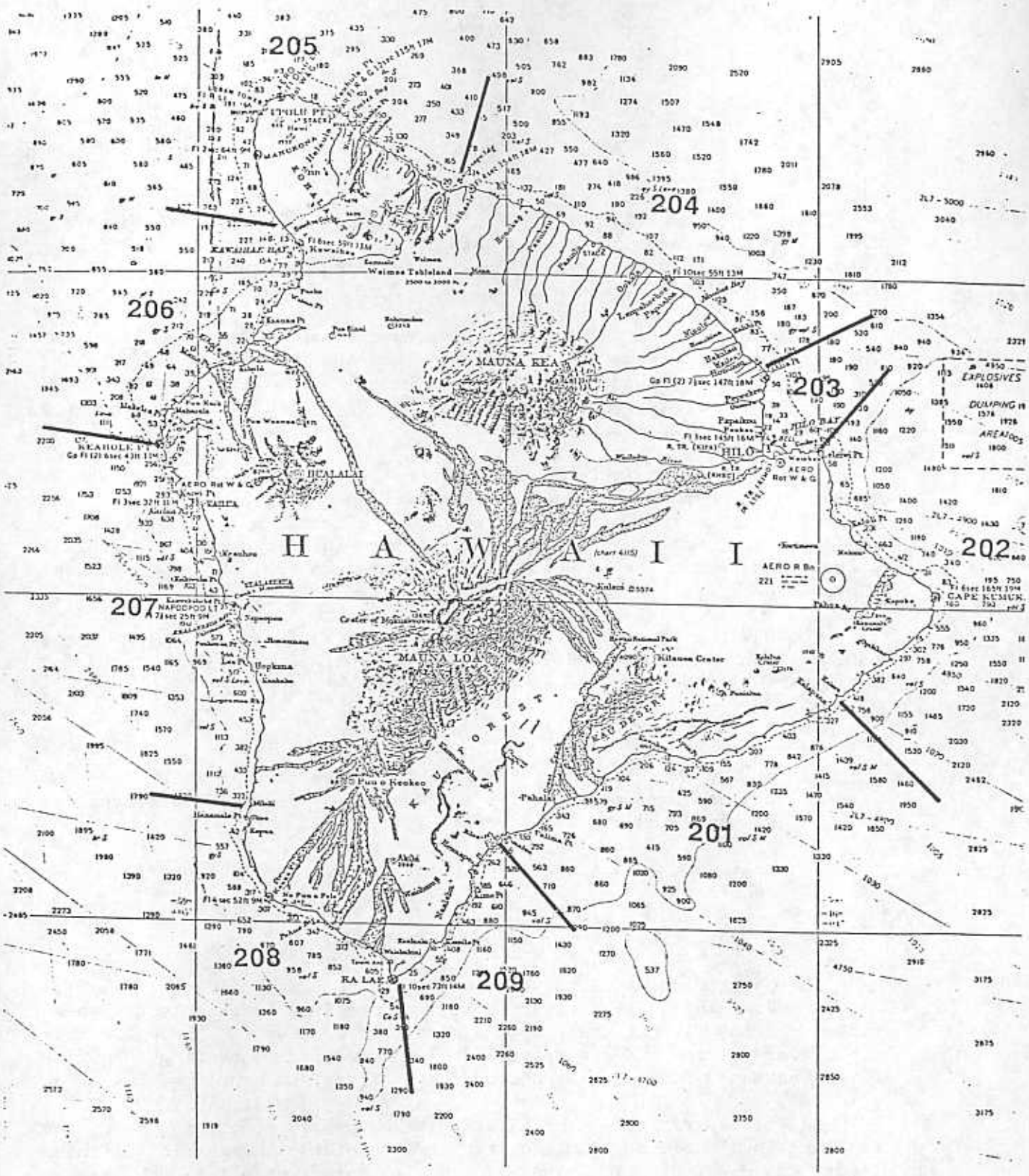


Figure 1.--Map of Hawaii, the Big Island.

for utilizing the Kumukahi-Pohoiki fishing grounds south of Hilo. Both these factors tend to constrain the growth of commercial fishing on the Big Island. Failure to provide additional vessel facilities would mean loss of potential benefits from increased fishing on a resource that is largely unaffected by localized fishing pressure, as discussed in the "resource" section of this report. The disposition of new fishing vessels between wet and dry storage depends on the availability of new mooring space and on the profit potential of the two types of craft, as discussed in the "fleet projection" section of this report. (Although trailered craft can be moored, and within limitation, moored craft trailered, moored craft tend to be longer and of deeper draft.)

Benefits are estimated solely from commercial fishing values. Potential recreational, subsistence, lifestyle, and sociological benefits of fishing opportunities in east Hawaii are considered to be met by existing facilities or by the expansion of "recreational" facilities in Hilo Bay. Small boat fishing in east Hawaii is closer to the norm of a full-time commercial activity than at any other site.

Benefits are expressed in net present values based on a discount rate of 8.625%. The project life is estimated to be 50 years from a 1990 base year. Prices are expressed in 1985 average values (June 1985 Honolulu consumer price index).

This report provides a detailed statistical profile of existing commercial fishing practices on east Hawaii with a special emphasis on vessels using Hilo Harbor and the Pohoiki launching ramp. The report presents an assessment of potential fishery resource limits and makes projections of future commercial fishing fleet growth. Operating characteristics, revenues, and costs for typical small-scale commercial fishing vessels are estimated as the first step in projecting the net benefits possibly accruing with the project. The report concludes with a discussion of the sensitivity of the results to alternative ways of framing the benefit analysis.

The data used for this report were the most complete available. Commercial fishing in Hawaii involves a broad range of activities, especially for the small boat fleets. Commercial fishing licenses cost only $10 in 1984, and commercial fishing participants were required only to report trips from which they sold their catch. [These regulations have changed in the intervening years.] Recreational anglers and subsistence fishers are not required to report their catches. Separating small boat operators who are primarily commercial from those who are only part-time is almost impossible. However, the existing commercial landings data collected by the Hawaii Division of Aquatic Resources (HDAR) and summarized in these reports provide a good picture of fishing activities on east Hawaii due to the intensity of commercial fishing in this area.

Detailed HDAR data were available through June 1984. [Data currently available for 1986 show a considerable expansion of Big Island landings since 1983.] How current the data are plays an important part in assessing the value of the east Hawaii fishery. The 1983-84 summary data show that landings at Pohoiki have increased 158% since 1980, while landings at Hilo have increased only 1%, and landings at South Point have declined by 56% (Table 1). Landings from the three main east

Hawaii ports as a whole have increased by 30% between 1980 and 1983-84. Landings from the Big Island in aggregate decreased by 9.6% through 1983. Landings in 1984 appear to be up. Annual variation of fish densities is an important problem in resource assessment in Hawaii.

Unlike most fisheries in the United States which are fully developed either through domestic, foreign, or joint venture operations, a number of Hawaii's fisheries are still being discovered. Commercial fishing is an important business in Hawaii, especially for an economy like that on the Big Island where the agricultural base has declined substantially over the past 20 years. One result of this dynamic situation is that the information base for resource and economic assessments is constantly changing. Some of these limitations are apparent in this report, but the report utilizes the best and most currently available information on the east Hawaii commercial fishery.

The evidence summarized in this report indicates that the net incomes available to fishing vessel operators (i.e., net revenue after all costs, including labor share) in the east Hawaii fishery are considerable. However, there is also considerable "downside" risk due to annual variability in available fish densities, dangerous weather conditions, and rough working conditions. There are also important "learning curve" aspects to Hawaii's small boat fisheries which tend to moderate entry into the industry: The fishing techniques are rather unique, the migratory patterns of the pelagic fishes are not well charted, and the marketing conditions for a high quality (and high priced) product are quite different from other fisheries. As a result, experience in the early stages of the ika shibi (deep-sea handline technique) fishery in east Hawaii has already shown that sustaining operations for a viable income over periods of seasonal and annual variability in the availability (i.e., "runs") of tuna require skill and the establishment of financial reserves. Adequate infrastructural support would make a major contribution to flattening the learning curve and encouraging greater utilization of the ocean's resources, and this appears to be capable of generating considerable value to the community.

Table 1.--Hilo area landings, 1980-83 and 1984.*
--Commercial fishing vessels--

Port	Pounds caught		Revenue** (1984 $)		Price*** (1984 $)	
	1980	1984	1980	1984	1980	1984
Hilo	544,155	551,253	$926,708	$862,149	$1.73	$1.59
Pohoiki	212,219	547,228	367,366	984,491	1.74	1.83
South Point	130,242	57,854	191,822	87,197	1.49	1.52

* July 1983 to June 1984.

** 1980 dollar values adjusted to 1984 values through use of the Honolulu consumer price index. Honolulu Consumer Price Index values: July 1980 = 228.7; December 1983 = 288.2. Price adjustment factor for inflation: F = 1.26.

*** Price is revenue per pounds sold, not revenue per pound caught.

Source: HDAR preliminary summaries for July 1983-June 1984 and NMFS summaries of HDAR landings records for 1980.

The benefit analysis part of this report indicates that the estimated current net annual revenue (revenue after all expenses) of the east Hawaii fishery is approximately $2.2 million but that this value can be expanded to as much as $4.5 million with a fully utilized launching ramp or moorage facility. These are substantial benefits but they would require additional changes in the infrastructure of east Hawaii, particularly in marketing the catch. Experience in Hawaii's commercial fishery has shown that such changes can be made, so the weight of this analysis is on the reasonableness of the estimates and assumptions which underlies it. The analysis also abstracts from potential environmental effects, social disruptions, and from possible subsidiary benefits through non-fishing boating.

II. Profile of Existing Fishing Practices

Fishing Vessels

There are approximately 1,360 fishing vessels on the Big Island, of which 475-500 can be considered commercial fishing boats. Of the commercial vessels, 190 of their owners live or moor their boats on the east side of the island. These estimates are derived from two sources: the Hawaii Department of Transportation (HDOT) official vessel

registration record, and a Statewide vessel inventory prepared by the National Marine Fisheries Service (NMFS) (Skillman et al. 1984; Skillman and Louie 1984).

--HDOT Registration Record

Vessels less than 5 net tons are registered with HDOT and are differentiated by use categories. Unfortunately breakdowns by island by use categories are not summarized in regularly appearing published reports. Furthermore, the HDOT's "commercial fishing" use category is not absolute, since vessel registration is not a criterion for selling fish. However, the official records do provide part of the picture of small boat activity on east Hawaii.

The 1984 HDOT registration record shows that 501 commercial fishing vessels were registered to owners living on the Big Island. There were only four charter fishing boats registered on the Big Island. Since most charter fishing boats are larger craft probably documented with the Coast Guard and moored on west Hawaii, they are excluded from this analysis. The breakdown of the commercial fishing vessels for the Big Island is shown in Table 2.

Table 2.--Moored and trailered commercial fishing vessels, Big Island, 1984.
--State Registration--

Area*	Moored	Trailered	Total
Total:	55	445	501
East Hawaii:	39	235	274
West Hawaii:	16	210	231

*Area determined by ZIP code of residence (see Figs. 2 and 3).

Source: HDOT annual registration data file. Summary by NMFS.

--NMFS Vessel Inventory

In 1983 a cooperative "vessel inventory" was conducted by the HDAR the Western Pacific Regional Fishery Management Council, and the NMFS (Skillman et al. 1984; Skillman and Louie 1984). This data source provides the most recent statewide information on fishing of registered vessels (Table 3). The survey had a 60% response rate. Although no formal validation of the nonrespondents was undertaken, it appears that the sampled responses were representative of the entire population of boat owners. The NMFS vessel inventory queried people concerning the sale of their catch but not about their official registration status. We have classified vessels as "commercial fishing" when the respondents indicated they sold at least 50% of their catch. This criterion is similar to State and Federal criteria for commercial fishing vessel loans. An extrapolation of the ratio of all registered boat owners to those responding to the survey indicates that an estimated 473 boats engage in commercial fishing on the Big Island. This compares quite closely with the HDOT figures for 1984, which was 501 registered commercial fishing vessels. ZIP code locations are indicated in Figure 2 and fishing vessels registrations across the Big Island are shown in Figure 3.

Table 3.--Vessel location and use--Big Island, 1983. Numbers corrected for response rate. Vessel location categorized by the owner's ZIP code.

By ZIP code area	All fishing	Commercial fishing*
Total:	1,361	473
East (Honokaa-South Point):	706	188
West (Mahukona-Milolii)	655	285

*"Commercial fishing" is categorized by whether the vessel operator sells at least half his/her catch (as indicated on the vessel inventory).

Source: Southwest Fisheries Center Administrative Report H-84-12 and supporting data.

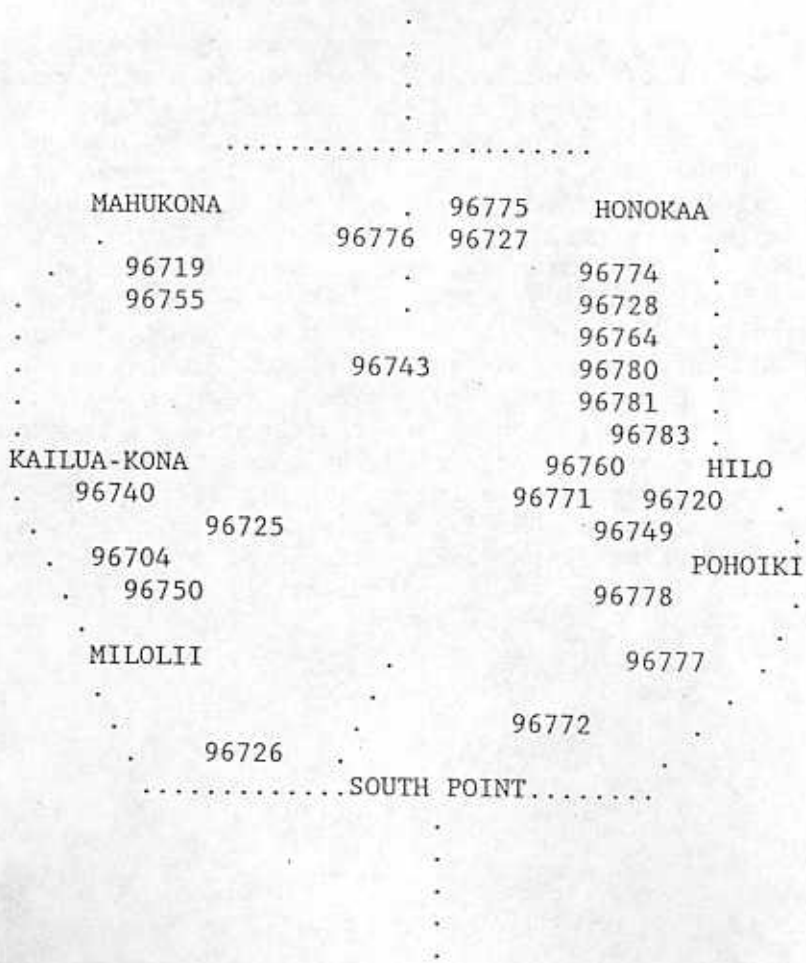
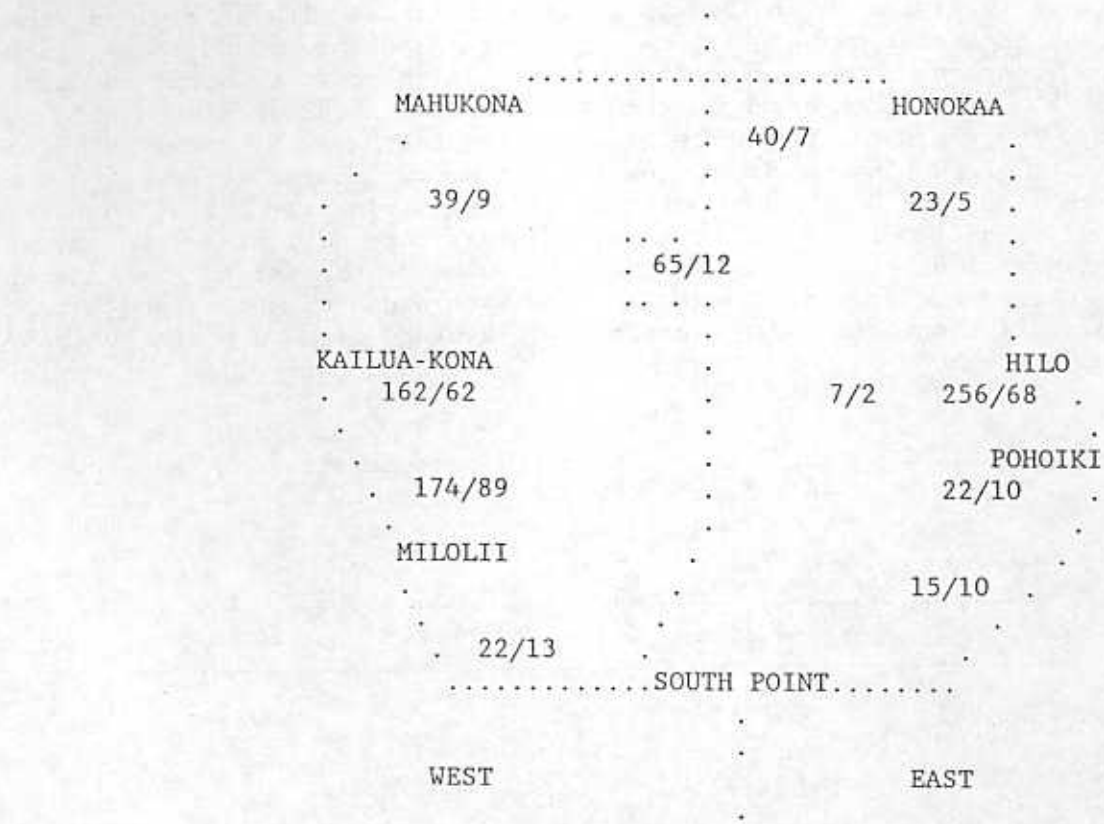


Figure 2.--Schematic map of Big Island with ZIP codes.



By ZIP code area:	All boats	Commercial
Total:	825	287
East (Honokaa-South Point):	428	114
West (Mahukona-Milolii):	397	173

Figure 3.--Big Island fishing boat registrations, 1983 (all fishing boats and commercial fishing boats).

Source: 1983 vessel inventory conducted by the HDAR, the NMFS (Honolulu Laboratory), and the Western Pacific Regional Fishery Management Council.

Data are not corrected for survey response rate. Responses from a 60.6% return to a complete mailing of 12,578 owners of vessels in vessel classes capable of commercial or recreational fishing (cf., Southwest Fisheries Center Administrative Report H-84-12).

"Commercial fishing" is defined as vessels whose owners sell more than 50% of their catch.

Most vessels on the Big Island are trailered (Table 4) and the serious commercial fishers are renowned for traveling around the island to use launching sites closest to the areas of highest seasonal density of market fish. The catch is then trucked to Hilo or Kailua-Kona for sale. However, the residence of vessel owners may be applicable to analysis of a future shift from trailered to moored vessels. The geography of the Big Island makes trailering vessels from east to west extremely difficult, and the trip by car is also sufficient to deter commuting to vessels moored on the other side of the island. Although some moored and trailered vessels, fish both sides of the island, most vessels fish one side or the other. The average size of these vessels is shown in Table 5.

Table 4.--Moored and trailered commercial fishing vessels --Big Island, 1983.
[Numbers corrected for response rate.]

Area	Moored	Trailered	Total
Total:	51	422	473
East Hawaii:	15	173	188
West Hawaii:	36	249	285

Source: NMFS Vessel Inventory.

Table 5.--Size classes for "commercial" fishing vessels --Big Island, 1983.
[Figures corrected for response rate.]

Size Class (feet)	Number of vessels
<9	120
10-19	210
20-29	140
>30	3
Total	473

Source: NMFS Vessel Inventory.

Note: Although the NMFS vessel inventory included Coast Guard documented vessels, it appears to have had a response bias toward the smaller craft registered by the HDOT.

The NMFS vessel inventory also questioned vessel owners on their major gear categories and levels of fishing effort. The most important fishing method for Hilo area commercial (as defined in Table 3) fishing boats was trolling, followed by ika shibi and palu ahi (the latter two are deep sea handline tuna fishing techniques, although they use hydraulic or electric power gurdies to haul the lines). Three vessels identified pole-and-line fishing for skipjack tuna as their second most important method of fishing. None identified longlines as an important gear type. Since most vessels use a number of gears throughout the year, for the rest of this report vessels will be considered multi-purpose fishing boats. Other information on gear use is available from the HDAR commercial landings file.

The average levels of fishing effort for Big Island commercial fishing boats are indicated in Table 6; the data are taken from the vessel inventory.

Table 6.--Big Island "commercial" fishing effort, 1983.*
[Numbers corrected for survey response rate.]

Fishing days per month	Number of vessels East Hawaii	West Hawaii	Total
<1 day	2	5	7
1-5 days	69	64	133
6-10 days	56	30	86
>10 days	61	134	195
Total	188	233	421**
Average trips/month	10.0	13.4	11.9
Annual trips/vessel	120	161	143
Fleet trips (annual)	22,600	37,500	60,200
Fleet trips (annual)***	22,600	45,000***	67,600***

* Commercial as indicated by those selling over half their catch.

** No answers to this question for 52 vessels.

*** Corrected for question response rate (421 of the 473 total respondents).

Source: NMFS vessel inventory.

In 1983 there were 1,761 vessels registered on the Big Island and 1,106 commercial fishing vessels statewide. There was no direct count of "commercial fishing" vessels registered with HDOT by island. However, the HDOT figures show that on average 43%, or an estimated 476 of the State's commercial fishing vessels are located on the Big Island. HDOT figures also indicate that some 28% of all vessels are used for commercial fishing. This provides an estimate of 493 commercial fishing

vessels on the Big Island. [The HDOT percentages are taken from the Corps' Cape Kumukahi report.] Thus the HDOT estimates and the NMFS vessel inventory estimate provide relatively consistent results and indicate the likely validity of the NMFS vessel inventory as a source of information on fishing practices.

Commercial Landings

--Commercial Fishing Growth

The only public source of long-term information on Hawaii's fisheries is the commercial landings reports collected by the HDAR. The most currently complete year available for this analysis was 1983.

The period since 1970 has shown considerable growth in Hawaii's commercial fishery, a growth which has been more than shared by the Big Island. In 1970, 8% of Hawaii's total catch was landed on the Big Island; in 1980 it was 32%. The number of licensed commercial fishers landing their catch in Big Island ports increased 210%, from 218 in 1970 to the 676 recorded in 1983. Big Island landings have grown 220%, from 910,000 lb. in 1970 to 2.9 million pounds (400-1,300 metric tons (MT) in 1983; revenue has grown from 360% (in 1985 dollars) from $930,000 in 1970 to $4.3 million in 1983. The number of trips has grown 212%, from 4,800 in 1970 to 15,000 in 1983. At the same time, the catch per trip has remained constant: 190 lb. per trip in 1970 and 194 lb. in 1983. (However, changes in fishing technology may affect the significance of these findings.) The inflation-adjusted revenue per trip has risen with the rising real price of fish from $194 per trip in 1970 (1985 dollars) to $288 in 1983. Data for 1983 are shown in Table 7.

Table 7.--Big Island commercial landings by port, 1983.

Port* (Code)	Pounds caught	Revenue** (dollars)	Trips***	Catch per trip
Hilo (152)	843,837	$1,123,567	3,426	246
Pohoiki (171)	662,073	974,919	1,859	356
Southeast Hawaii (181)	32,853	69,478	281	117
South Point (101)	75,127	100,220	483	156
Subtotal-East	1,616,241	2,274,346	6,078	266
West Hawaii				
110	71,476	84,653	524	136
111	45,823	50,810	285	161
114	42,056	65,801	244	172
115	177,766	241,541	445	399
116	134,812	182,326	1,675	80
117	657,332	814,791	4,182	157
133	102,567	174,912	1,016	157
134	5,779	9,219	130	44
Subtotal-West	1,241,092	1,628,995	8,559	145
Other	40,161	42,465	314	128
Total	2,897,494	$3,945,806	14,951	194
	(1,315 MT)			(88 kg)

* Some ports not listed but included in total.

** Current year (1983) $ values.

*** Trips calculated from HDAR raw data through an iterative matching and comparison technique.

Source: HDAR commercial landings records.

--Reporting Problems

The HDAR commercial landings records and the NMFS vessel inventory findings can be compared to check for consistency of results.

The HDAR data set shows that approximately 340 licensed commercial fishers reported landings on the Big Island in 1983. This indicates substantially less commercial fishing activity than identified in the 1983 vessel inventory (473 commercial fishing vessels) and the 1984 HDOT vessel registration (501 commercial fishing vessels) for the Big Island. This is important because the HDAR data also include shoreline anglers and nearshore divers. The HDAR licensed commercial fishers took a reported 14,951 trips in 1983 on the Big Island, vastly less than estimated by the NMFS vessel inventory.

The level of effort indicated by the HDAR commercial landings records (Table 8) is only 34% of the effort estimated from the NMFS vessel inventory. The latter corresponds relatively well with effort estimated through Corps surveys of commercial fishing vessels on the Big Island (1980 and 1985) and the NMFS cost-earnings survey (1982). Questions concerning underreporting by HDAR commercial license holders have been raised persistently. One possibility is that many part-time commercial fishing operators, as well as some full-time but small-volume commercial fishing operators, only report sales which they make to the larger wholesale seafood dealers and the auctions. Another possibility is that fish assigned to the crew (these vessels usually take 1 or 2 crewmen) may be unreported. A NMFS survey of wholesale fish dealers showed at least $18 million of fish purchased from local fishing operators in 1979 statewide, whereas HDAR records show $10.5 million. The HDAR notes that a particular underreporting problem existed in 1979; however, landings value 1978 were only $13.6 million (corrected for 1 year's inflation), still substantially less than that shown in the wholesale survey. This provides an estimated underreporting of 24%. Other surveys and counts have suggested an even greater underreporting. These issues are considered again in the "benefits" section of this report.

However, there is no evidence to suggest that the nature of such underreporting has changed over the years for Hawaii's small-boat fleet. Therefore HDAR records can be used to indicate long-term trends in fisheries which are primarily harvested by smaller craft. From a resource assessment point of view, there is still a problem with the nonreporting of recreationally caught fish, a segment which is believed to have increased dramatically Statewide in the past 15 years. This is not considered to be a substantial portion of the east Hawaii fishery.

State licenses are issued on a fiscal year basis. The NMFS summaries of the HDAR data are computed on a calendar year basis. This double counts the number of people fishing in a calendar year since different license numbers are issued for each fiscal year. Our original report prepared for the Corps erred in not identifying this fact. As a result, the extrapolated figures in this report differ somewhat from the original report.

A simple comparison of the HDAR average figures and those from the NMFS vessel inventory is shown in Table 8. Experts who specialize in surveying fishing populations indicate the deviation of official landings levels of effort from surveyed levels of effort is not unusual. There is probably a bias upward in surveys of effort and a tendency to omit zero or low catch trips from survey responses, to catch per trip, but there is a downward bias in effort for official records.

Table 8.--Comparison of HDAR and NMFS estimates for commercial fishing on the Big Island, 1983.

Category	HDAR all commercial licenses	HDAR ** full-time commercial licensees only	NMFS commercial vessels
Number Reporting*	342	78	505
Annual Trips per license or vessel	43	104	143
Catch per Trip	183	253	215
Annual Catch per license or vessel	7,867	29,210	30,745
Annual Revenue per license or vessel (1985$)	11,900	$40,315	$45,300
Total Trips	14,700	8,100	72,200

* Number Reporting is the total number of license numbers appearing in the landings data set, divided in half to account for the fiscal year - calendar year problem.

** For license holders reporting more than 10,000 lb. landed in 1983.

The values per license are changed from the original report because of the recalculation of the number of licenses per calendar year.

Totals in license number tables are less than aggregate tables due to deletion of unspecified license numbers.

Source: HDAR data from 1983 commercial landings records.
NMFS data from 1983 vessel inventory and 1982 cost-earnings survey.

It is probably misleading to report only average values per trip and per vessel using HDAR totals because of the high incidence of vessel operators who are clearly not full-time commercial fishers. Therefore the data are stratified by the level of effort or landings. Table 9 shows this effect for license holders reporting landings on east Hawaii. Figures are given for all license holders and for license holders reporting at least 5,000 lb. landed in either half of 1983. The 5,000-lb. criterion is arbitrary, but it represents approximately 10,000 lb. annually $14,400 gross income, or approximately $10,000 on net income. This is about the same as the statewide average per capita income level for 1983 ($12,396). Such vessels are considered "full-time commercial" fishing boats for the purposes of this report.

The HDAR data show that defining "full-time" on the basis of 5,000 lb. landed in either 6 months half of 1983 makes a substantial difference in per trip per and license values. Trips per vessel are more than double the average for "full-time commercial" vessels, catch per vessel is almost four times, and catch per trip is almost 50% greater than average. Per vessel and per trip values are similar between the NMFS cost-earnings survey and the HDAR "full-time" vessels.

The uneven distribution of the catch among vessels is well displayed using cumulative percentages. In 1983 of the 342 people reporting landings on the Big Island, 5 license holders (1.5%) caught 14.3% of the fish; half the fish were caught by just 32 license-holders. Only 78 reported landings in excess of 10,000 lb. (Table 9); 76% of total landings by 22.8% of the license holders.

Table 9.--Big Island landings (annual total) by vessel, 1983, stratified by landings per license-holder.

Pounds	Revenue*	Trips	Catch per trip	Revenue* per trip	Price*	Percent of total landings
			Top 78 licensees			
2,044,450	$2,858,716	8,086	253	$354	$1.44	76.0%
			Other 264 licensees			
646,033	$ 845,533	6,609	98	$128	$1.42	24.0%
			Total all 342 licensees			
2,690,483	$3,704,249	14,695	183	$252	$1.43	100.0%

*Current year (1983) dollar values.

Totals less than other tables due to deletion of unspecified license numbers.
Source: HDAR commercial landings file.

Landings by Gear Type

Even in 1980, early in the growth of the ika shibi fishery (Ikehara, 1981), deep-sea handline gear was credited with 56% of total Big Island landings, and trolling accounted for 25% of landings. However, in east Hawaii, deep-sea handline accounted for 84% of landings at Hilo harbor and 70% at Pohoiki. Trolling was still important at Pohoiki, 27% of landings. In 1982, by which time the ika shibi and other deep sea handline techniques for large tuna were well established, HDAR created two new handline categories, ika shibi (gear type 8) and palu ahi (gear type 9). In 1983 these two new gear categories comprised 21% of all deep-sea handline landings (Tables 10 and 11).

Table 10.--Island commercial landings by gear type, 1983.

	Gear code*	Pounds caught	Revenue	Trips
Pole and line	1	--	--	--
Flagline	2	93,172	$141,498	169
Deep-sea handline				
Bottom	3	1,375,542	2,060,001	5,646
Ika shibi	8	348,403	433,310	786
Palu ahi	9	14,224	19,705	74
Inshore				
Handline	4	232,384	309,513	2,528
Trolling	6	652,188	762,831	4,931
Trap	11	985	1,348	24
Opihi	12	3,985	8,184	77
Spear	13	22,891	32,917	166
Opelu net	21	68,801	92,044	202
Gill net	22	9,522	13,296	82
Throw net	27	1,691	2,259	45
Other	99	3,327	6,515	45
Total		2,917,259	$3,979,662	15,004

*Some gear types not listed but included in total.

Source: HDAR Commercial landings records.

Table 11.--Hilo and Pohoiki area landings by gear type, 1983.

Year code	Pounds caught	Pounds sold	Revenue dollars	Trips
		Hilo		
3	524,010	523,761	739,026	1,620
4	60,170	59,077	64,896	485
6	135,921	131,985	174,644	974
8	115,980		137,676	255
9				12
12				11
13	5,277	5,277	7,524	34
Subtotal	843,837	823,533	1,123,568	3,426
		Pohoiki		
3	365,799	365,524	541,942	812
4	6,381	6,131	7,520	44
6	75,346	73,713	129,376	485
8	207,619		285,920	460
9	9,312		14,728	50
Subtotal	662,073	656,027	974,918	1,859

Source: HDAR Commercial Landings records.

The preponderance of deep-sea handline landings do not quite correspond to the answers given on the NMFS vessel inventory, which found greater use of trolling gear, but the figures do correspond to the Corps surveys and to on-site inspection, as well as to the composition of landings. Apparently the use of small-scale longline techniques (which will allow greater mobility and distance from shore) is increasing in the Hilo area, but the level of effort going into longline fishing in east Hawaii has yet to be calculated.

Landings by Fishing Area

One of the key issues in resource and benefit analysis is the proximity of harbors and launching sites to prime fishing grounds. The highest volume of landings comes from areas off Kailua-Kona on the Big Island's west coast, where the weather is better and the fishing pressure is greatest (Table 12). However, on the east coast of the Big Island are some of the highest fish densities (as determined by catch per trip). Figure 4 is a map of the reporting areas and Figure 5 compares catch rates for Hilo and Pohoiki landings. Three of the best offshore areas are immediately off Hilo and Pohoiki (zones 125, 126, and 127). Furthermore, when comparing only deep sea handline catch rates (to "normalize" for fishing power), east Hawaii is higher than average (Tables 13 and 14). These rates are much higher than for trolling gear catches in the same areas (Table 15).

Adjacent areas frequently have substantially differing catch rates. Frequently this is because of the proximity of nearer areas to part-time and recreational fishers who may report commercial landings (when they sell their catch) but have a lower level of skill, and because this higher effort reduces the immediate density of fish available for capture, or because of the species and gear selection of anglers departing from different ports. There is also substantial natural variability in catch rates, especially for trolling gear.

Table 12.--Big Island commercial landings by area, 1983.

Area	Pounds caught	Pounds sold	Revenue*	Trips
		East Hawaii areas		
104	4,732	5,011	6,306	39
105	39,863	39,060	46,677	431
106	40,733	40,146	55,194	365
107	16,207	15,813	27,347	117
108	10,549	10,432	16,675	79
124	6,997	6,982	10,370	45
125	374,966	358,265	453,137	1,560
126	738,626	709,881	1,082,321	2,202
127	309,470	306,687	457,037	980
128	21,797	21,414	44,005	131
194	16,145	16,061	19,463	14
		West Hawaii and other areas		
100	30,191	28,613	35,349	224
101	244,051	238,342	351,289	2,043
102	98,983	97,207	134,195	757
103	8,761	7,470	14,202	121
120	69,613	68,748	98,320	448
121	395,988	372,320	460,767	2,508
122	383,832	360,761	511,532	2,542
123	13,676	13,110	25,561	99
184	6,387	6,152	15,897	52
188	8,714	7,939	6,017	26

*Current year (1983) dollar values.

Source: HDAR commercial landings records.

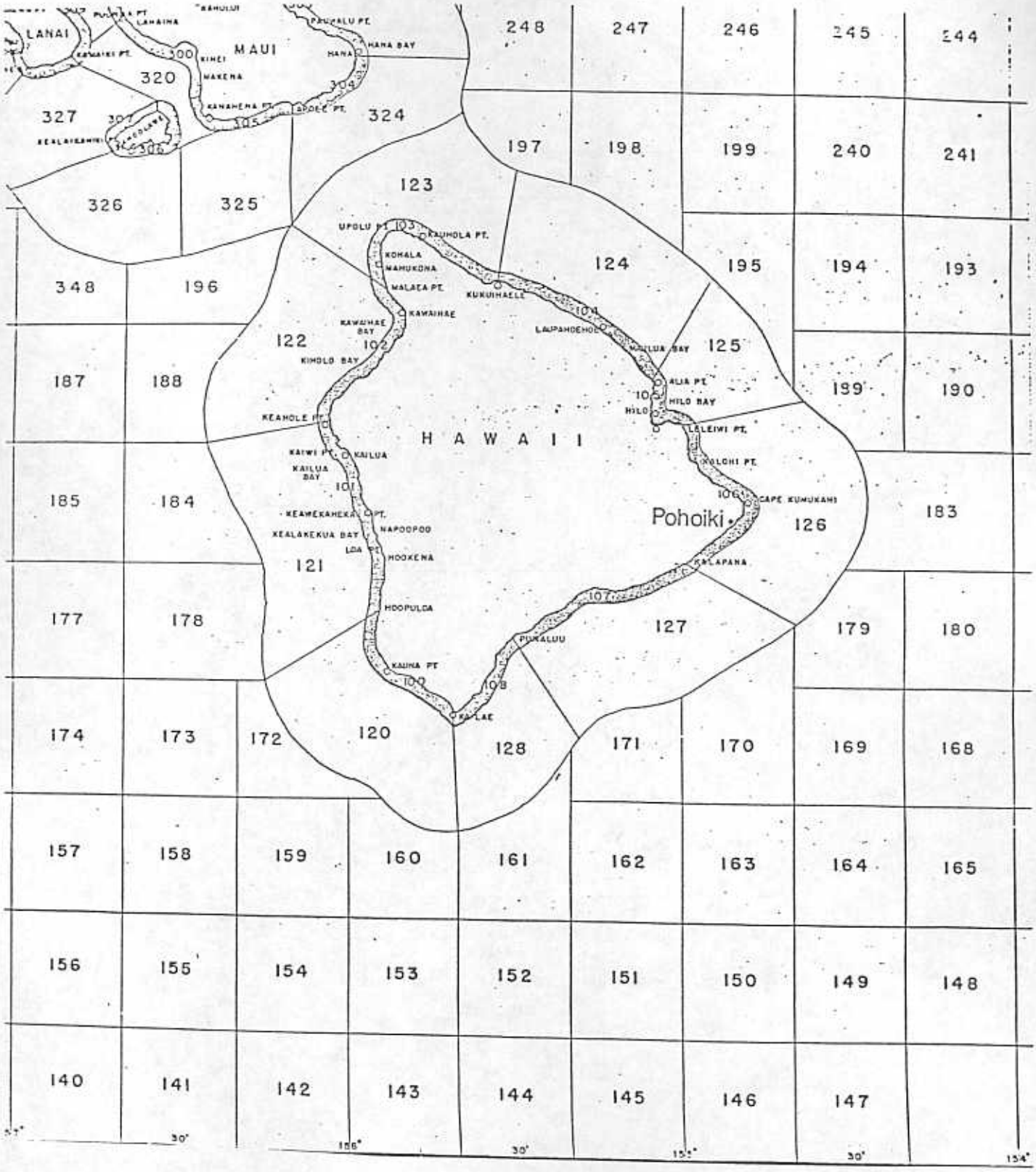


Figure 4.--Big Island statistical reporting areas
Source: HDAR.

```
                                                A194
                                                   H 1295.0 CPT
                                                   H 12 T
                                                A125
Hilo   A105                                        H 240.2 CPT   P 266.3 CPT
       H 96.6 CPT                                  H 1508 T      P 28 T
       H 403 T

       .............
Cape Kumukahi    A106                          A126
                    H 150.9 CPT                   H 332.9 CPT
                    H 167 T                       H 1072 T

            .....   P 92.2 CPT                          P 335.7 CPT
Pohoiki             P 46 T                              P 999 T

       A107
       H ---- CPT          A127
       H 6 T                  H 135.8 CPT
                              H 81 T
       P 275.8 CPT
       P 34 T                 P 401.2 CPT
                              P 680 T
```

Hilo average: H 246.3 CPT Catch per trip
H 3426 T Total trips

Pohoiki average: P 356.1 CPT Catch per trip
P 1859 T Total trips

Areas identified as A _____

Figure 5.--Commercial fishing landings by area (Hilo and Pohoiki), 1983.

Table 13.--Big Island deep-sea handline (gear code 3 only) landings by area, 1983.

Area	Pounds caught	Revenue dollars	Trips	Catch per trip	Revenue per trip	Price per pound
			East Hawaii			
105	5,055	$8,404	65	77.76	$129.29	$1.71
106	7,241	12,763	66	109.71	193.37	1.76
107	5,278	8,979	20	263.90	448.95	1.70
124	2,698	6,303	25	107.92	252.12	2.33
125	236,713	300,898	733	322.93	410.50	1.27
126	519,859	789,168	1,338	388.53	589.81	1.53
127	142,414	213,413	382	372.81	558.67	1.50
128	16,175	31,655	93	173.92	340.37	1.99
Subtotal	952,292	1,392,232	2,743	347.17	507.56	1.47
			West Hawaii and other areas			
Subtotal	423,250	667,769	2,903	145.80	230.03	1.62
Total	1,375,542	2,060,001	5,646	243.63	$364.86	$1.52

Source: HDAR commercial landings records.

Table 14.--Comparison of Hilo and Pohoiki landings by area, 1983. (Deep-sea handline gear, gear code 3 only.)
[Catch values not given for areas with small number of trips.]

	Catch per trip (pounds)		Revenue per trip		Trips	
Area	Hilo	Pohoiki	Hilo	Pohoiki	Hilo	Pohoiki
101	87.62		$117.62		8	
104	206.57		292.57		14	
105	77.76		129.29		65	
106	164.88	13.66	303.34	$21.66	26	
107		286.11		483.05		18
120	96.80		124.20		5	
121	132.20	30.25	193.00	58.25	5	
123	29.66		67.66		6	
124	105.54		173.90		11	
125	322.61	406.50	409.13	580.50	721	10
126	353.94	441.35	544.63	662.95	727	530
127	180.16	500.04	307.50	716.09	12	244
128	72.00	164.00	0.00	349.33		
170	49.00		110.00			
183	151.00		230.00			
194	1,543.40		1,802.80		10	
195						
199	125.00		146.80		5	
524	55.00					
Average	323.46	450.49	456.19	667.42	1,620	812

Source: HDAR commercial landings records.

Table 15.--Troll landings (gear code 6 only) for Hilo and Pohoiki, 1983. [Catch values not given for areas with small number of trips.]

Area	Pounds caught	Revenue	Trips	CPT	RPT	Price
			Hilo			
105			2			
106	854	$1,066	12	71.16	$88.83	$1.34
107		0				
124		12				
125	82,920	101,894	620	133.74	164.34	1.27
126	37,524	51,805	230	163.14	225.23	1.40
127	8,839	13,846	69	128.10	200.66	1.56
Total	135,921	174,644	974	139.55	179.31	1.32
			Pohoiki			
106			1			
107			4			
125	3,261	3,892	17	191.82	228.94	1.25
126	39,647	68,344	310	127.89	220.46	1.77
127	30,215	53,158	151	200.09	352.03	1.78
128			1			
Total	75,346	129,376	485	155.35	266.75	1.76

Source: HDAR commercial landings records.