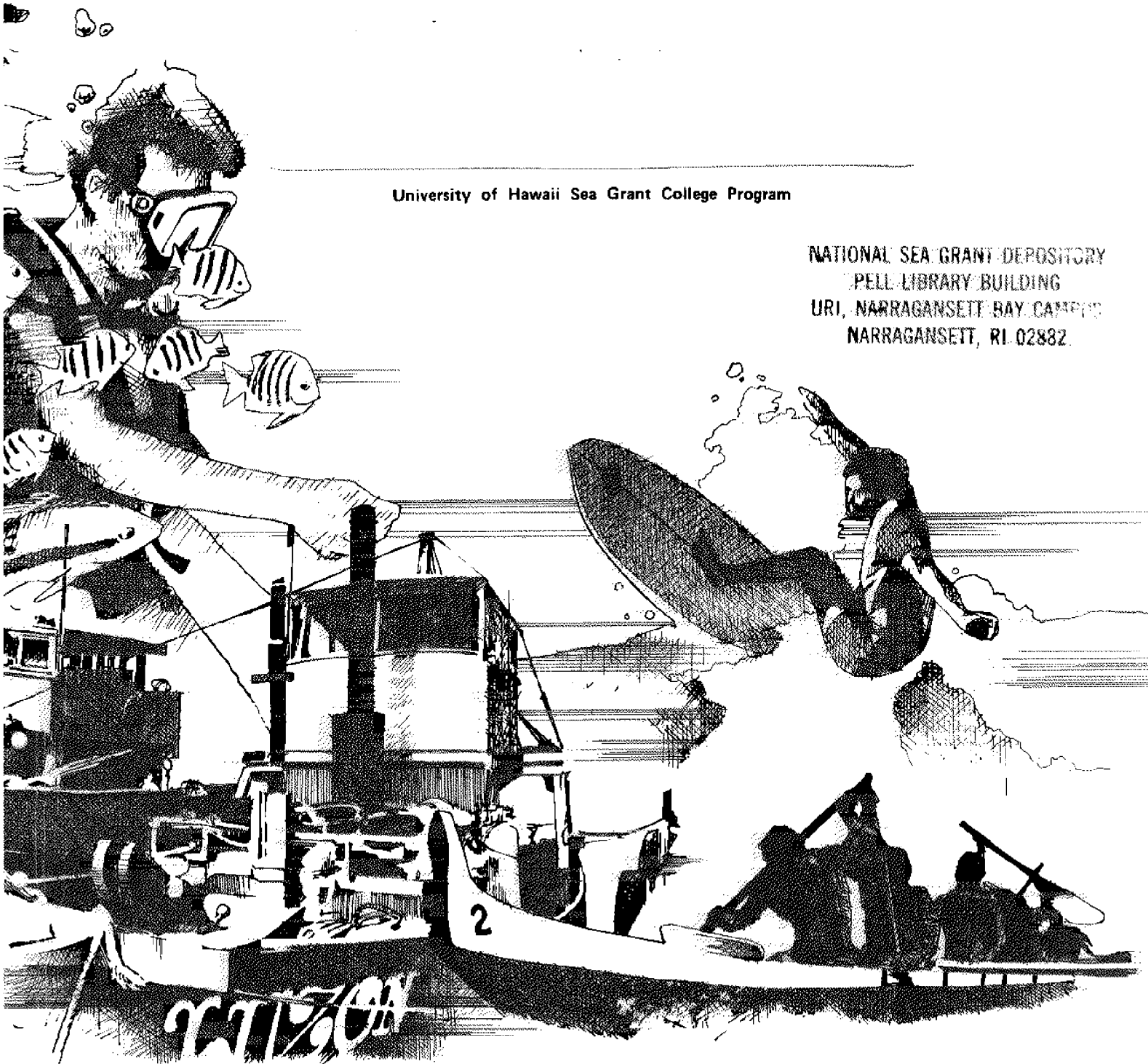


Studies on Marine Economics

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**OPERATIONS OF COMMERCIAL FISHING VESSELS BERTHED
AT KEWALO BASIN: AN ECONOMIC ANALYSIS**

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PURPOSE OF THE STUDY

The purpose of this research was to develop economic information on commercial fishing boats docked at Kewalo Basin. The boats berthed at Kewalo Basin fall into three main categories: (1) large sightseeing and cruise vessels; (2) sport fishing or "charter" boats which carry four to six paying fishers; and (3) boats used to catch fish to sell.

This study is limited to the third group or the commercial fishing boats which do not engage in charter fishing. The data in this report have been averaged, or otherwise grouped, to ensure that the financial details for the individual boats remain confidential.

TYPES OF BOATS BERTHED AT KEWALO BASIN

There are 124 individual boat berths at Kewalo Basin. In addition, about a dozen small skiffs are usually tied up to cables in the seaward corner of the basin. At least two dozen transient boats may be temporarily nested as many as six abreast or docked along the Ewa side of the basin near the tuna cannery. Often several boats are regularly docked two to a berth or in berths that are not identified by either a letter or number.

There are 11 large vessels and 3 small cruise vessels berthed at Kewalo Basin. They are located mainly along the Ala Moana Boulevard side of the basin. Charter fishing boats are also berthed along the street front, as well as on the Diamond Head side.

There is no clear distinction between charter boats and commercial fishing boats. Most charter boats leave Kewalo Basin without passengers at least occasionally in order to catch fish to sell. Charter boats having a \$10 commercial fishing license supplement their passenger-generated income when catches on the fishing grounds are especially good, or when fish prices are high, or perhaps when their principal business is slow, as it was during 1982.

The state government distinguishes charter from commercial fishing boats according to which type of activity produces the major part of the total income (Table 1). Charter boats pay twice as much in docking fees as do commercial fishing boats. While a 50-foot charter boat berthed along the Diamond Head side of the basin would pay \$2,040 per year, the same boat would pay only \$1,020 if classified as a commercial fishing vessel. Most charter boats belong to one of five boat associations that maintain offices and help arrange passenger bookings. Approximately 26 boats are considered charter vessels by the Harbors Division of the state of Hawaii's Department of Transportation, and

another nine engage in a significant amount of charter work when it is available.

TABLE 1. VESSELS BERTHED AT KEWALO BASIN BY TYPES

Types	No.
Commercial fishing	59*
Charter and part-charter/ part-commercial fishing	35
Cruise	14
Unoccupied slips	16
State-owned	2
Dealer-owned	1
TOTAL	127

*Plus several skiffs

About 60 boats are exclusively commercial fishing vessels. However, at least 11 of these are rarely taken out of the basin. There are many reasons for a boat's inactivity, including major engine problems, illness or death of the skipper-owner, difficulty in finding an acceptable skipper or crew, the owner is trying to sell the boat, personal reasons, or the owner-skipper is nearing retirement and may not find the strenuous effort to fish regularly worthwhile.

At this time, there is a waiting list of 35 for the commercial fishing vessel berths at Kewalo. One reason for the long list and also for the large number of inactive boats is the low docking fee. A boat in the 35-foot range docked at one of the piers pays \$1.25 per foot per month, or \$525 per year. The fees are low compared with, say, California's docking fees, or a small active boat's gross yearly revenue, or the cost in time and dollars of moving a boat in and out of the water.

In June 1982, the Harbors Division took steps to assure that the available dock space would be allocated only to serious commercial fishers by establishing minimum catch requirements. For example, boats larger than 5 net tons but with crews of six or less, now must, if requested, be able to demonstrate gross annual receipts of over \$40,000. Most of the inactive boats probably

fall in this category. Exceptions to the regulation will be allowed if the boat or skipper is disabled. Table 2 shows gross revenues by size of boats for commercial fishing vessels with berthing space in 1981.

TABLE 2. GROSS REVENUE OF COMMERCIAL FISHING BOATS BERTHED AT KEWALO BASIN, 1981

Main Activity	No. of Vessels	Approximate Gross Revenue	Approximate Full-time Employees
Aku	12	\$4,500,000	130
Akule	6	100,000	8
Albacore	3	405,000	9
Bottomfishing	14	630,000	33
Longlining	4	280,000	17
Multipurpose	3	2,170,000	43
Inactive	11	10,000*	0
Unknown	6 + several skiffs	10,000*	0
TOTAL	59	\$8,105,000	240

*Estimate

BOTTOMFISHING COSTS AND RETURNS

Historically, Hawaii's deep-water bottomfishing fishery has received much less public attention than the local aku fishery. This is because the annual gross market value of aku is several times greater than for bottomfish. As a result little is known about the economics of bottomfishing.

To obtain operating revenue and expense data for bottomfishing vessels berthed at Kewalo Basin a survey was made in July and August of 1982. The survey data make it clear that the characteristics and methods of these boats are so different that there is no such thing as a typical boat. In 1981, surveyed boats made between 3 and 30 trips per year and grossed between \$2,000 and

\$150,000 from fish sold. Crew size, including the skipper, ranged from 1 to 4. Trip length varied from storm-shortened 1-day trips to some lasting over 2 weeks. The amount of fish caught was between 0 and 8,000 pounds per trip.

Among the variables that affected a boat's activity and economic picture were: the size and condition of the boat; the age, health, and financial condition of the skipper; the skipper's knowledge of fishing areas; and whether the skipper or another party owned the boat.

To show the levels of costs and returns which might be achieved for a bottomfishing operation, a composite picture of a successful mid-sized (35 to 45 feet) bottomfishing boat operating out of Kewalo Basin is presented in Table 3. This boat, like most of the more successful boats in this class, would have had to have been active for almost all of 1981. Most bottomfishing boats in the data set were not this active or successful.

TABLE 3. GROSS REVENUE AND OPERATING EXPENSES REPRESENTATIVE OF ACTIVE MID-SIZED (35 to 45 feet) BOTTOMFISHING BOATS BERTHED AT KEWALO BASIN, 1981

	Per Trip	Total
Gross revenues		
Catch (pounds of fish)	711	21,802
Price per pound	\$ 2.96	\$ 2.96
TOTAL	\$2,104.56	\$64,533.92
Operating expenses		
Auction commissions @ 10 percent		\$ 6,453.39
Fuel		4,914.00
Bait		3,290.00
Ice		1,476.00
Health insurance		749.00
Disability insurance		320.00
Miscellaneous		1,382.00
TOTAL		\$18,584.39
Net available for distribution to boat and crew shares (Gross revenue - Operating expenses)		\$45,949.53

Note: Information is based on 31 trips averaging 7.1 days or 219 days at sea.

Fishing effort, catch, and prices

The 31 trips in 1981 by the representative boat would have allowed for about 2.5 trips per month. The total days at sea varied considerably among the more successful boats with at least one boat at sea almost 3 out of 4 days for the entire year with half its trips lasting more than 9 days.

For more successful boats there were only a few occasions when the boats returned to port without any catch; these trips were short, perhaps because of storms or mechanical trouble.

On the other hand, a boat might spend relatively long periods of 15 to 50 days at dock that apparently were not related to bad weather. When running regularly, these boats tended to have a fixed schedule, e.g., 5 to 7 days out at sea, 2 to 3 days in port or 9 days out, 2 days in.

The total pounds figure used in Table 3 would represent the amount sold and almost certainly would be less than the amount caught. Some fish reach the Honolulu fish auction in such poor condition that they cannot be sold. Kahala is often not sold because it may be unsafe to eat. The fishers consume some of their catch themselves and give some away as gifts. Also, fish is an excellent item with which to barter, and a wide variety of goods and services can be obtained with fish in Hawaii, through formal or informal transactions.

The average catch of 711 pounds of fish per trip can be stated another way. The successful mid-sized boats averaged 1.67 crew members per boat. That means each person caught 427 pounds of fish on the average trip of 7.1 days, or almost exactly 60 pounds of fish per person per day while out of port during 1981.

The \$2.96 per pound figure used in Table 3 was based on annual prices reported by mid-sized boats in 1981. It is high compared with published state Division of Aquatic Resources figures. For 1978, 1979, and 1980, the average price per pound received for 10 common offshore bottomfish was \$1.65, \$1.79, and \$1.72, respectively. Unpublished data from the Division of Aquatic Resources and compiled by the National Marine Fisheries Service show prices of \$1.27, \$1.68, and \$2.35 per pound, respectively, for those years for fish landed at Kewalo by non-aku, non-longline vessels.

For boats in this class, the highest average prices reported for a single load in December exceeded \$6.75 per pound while the lowest prices received, usually during the summer, were less than \$1.50 per pound.

Operating costs

The expense of selling fish at auction is clearly the major operating cost. However, a number of services are provided by

the United Fishing Agency, for its fee. It not only auctions the fish, but also picks up the fish at the dock, delivers it to the buyer, and handles bookkeeping for the boat owner.

The average price for diesel fuel in 1981 for boats buying from one of the Kewalo dealers was about \$1.24 per gallon, with \$.05 to \$.06 less for regular or high-volume customers. Using the \$1.24 per gallon figure and the total fuel expense figure of \$4,914, an active bottomfishing boat used 3,963 gallons of diesel fuel in 31 trips, or 128 gallons per trip, or 18 gallons per day while at sea.

The most frequently used type of bait among these three boats were aku, opelu, and squid, in that order. The average price paid in 1981 for all bait was \$.75 per pound. At this price, 4,387 pounds of bait were purchased per boat to catch the 21,802 pounds of fish sold, a 1:5 catch ratio. Usually, the ratio will be lower, since bottomfishing boats occasionally catch their own bait, or use deep-water fish which they have caught if these fish are in very poor condition, an unmarketable species, or if bait is in short supply.

Ice is purchased in 300-pound blocks, chipped, and loaded into a boat's hold. Each block cost \$3.50 in 1981, so on each of the 31 trips, an average of 13 to 14 blocks totaling about 41,100 pounds were purchased for \$48.

Miscellaneous expenses include the 0.5 percent state excise tax, small supply purchases, life insurance, and in the case of one boat only, \$20 per month to Kewalo Basin for water, a storage locker, and parking lot privileges.

Revenue available for distribution to ownership costs and crew

It is customary to subtract operating expense from gross revenue to determine the amount available for boat and crew shares. The customary distribution for bottomfishing boats is 60 percent for crew and 40 percent for the boat owner. Table 4 shows the distribution of these costs for the representative bottomfishing operation portrayed in Table 3.

Boat owner's share

After the boat owner's share of \$17,782 is determined, several other costs such as wharfage and payroll taxes are deducted, reducing the share to \$14,268 to meet ownership costs to be accounted as return on investment.

These ownership costs include such items as interest payments on indebtedness for the boat or gear purchase, depreciation on the vessel, gear replacement and repair, liability insurance, drydocking, and hull insurance. Hull insurance is often estimated at 4.5 percent of vessel value, or perhaps \$1,500 to \$2,000 per year for a \$40,000 boat. Liability insurance for \$100,000

may cost \$3,000 per year. However, many boat owners do not carry either hull or liability insurance.

TABLE 4. EARNINGS DISTRIBUTION FOR A REPRESENTATIVE MID-SIZED BOTTOMFISHING BOAT BERTHED AT KEWALO BASIN, 1981

	%	Amount
Net available for distribution (from Table 3)	100	\$45,950
Boat share	38.7	17,782
Wharfage fees	--	952
Social security owner tax	--	1,436
Unemployment compensation tax	--	1,126
Net to meet ownership costs and return on investment		14,268
Crew share	61.3	28,167
Provisions		962

*May include interest on boat loans or equipment, depreciation, gear replacement, insurance and repair

The drydocking expense is highly variable. To take the boat out of the water and put it back costs about \$4 per foot for boats in the 40-foot range. While drydocked, there is a charge of \$1 to \$1.25 per foot per day. If drydocking lasts 2 weeks, expenses -- before any parts and labor costs -- would thus be about \$850. Minor repairs may run up to \$2,000, while an engine overhaul may cost \$4,000. Drydocking has traditionally been done twice a year, but many owners are stretching the period between work to 9 months or more.

Crew share

The crew member's average earnings amounts to \$527 per trip, or \$74 per day at sea if each person catches the average of 60 pounds per day. If working days are assumed to be 12 hours long, earnings amount to \$6.18 per hour. Sixteen-hour days would mean a wage of \$4.64 per hour. When one day of work on land, used for preparing to go to sea or doing repairs, is added to each trip, the crewman's wage on a successful boat falls to \$5.42 and \$4.06 per hour for 12 and 16 hour days, respectively.

In cases where the boat is owned by one of the crew, the owner-crew member's earnings would be the sum of the boat share and a crew share, or \$34,095 minus interest, insurance, and repair costs.

Price volatility and earnings

All the bottomfishers in the survey complained about the volatility of the prices they received for their catch. It is not unusual for the price received at the auction to double or halve within 2 or 3 days, depending on the amount of fish offered for sale or the buyers appraisal of market conditions.

Crew

The survey indicated that for most owner-operated bottom-fishing boats, finding a crew is not difficult even with the income volatility that characterizes this type of activity. This is because only one to three crew members are needed per boat. Family members or old acquaintances often round out the crew. It is more difficult if the owner does not skipper the boat. The owner must then hire a skipper who in turn hires a crew. The turnover of crew and skippers is often high and there are not enough experienced bottomfishers to fill the places of those who leave.

One skipper who takes out inexperienced crew has found that the effort expended in training is soon lost because the crew often decide they do not like that kind of work. One problem is the working conditions. The crew is at sea for a week on the average. Also, the boats are old and the amenities few. For example, the showers for the week-long trip are buckets of seawater.

Those who go to sea must be prepared to accept large fluctuations in their monthly earnings. If fishing is poor, a crew member's share in some cases amounts to little or nothing for a week at sea. A storm or repairs may keep the boat in port for a week or more. During these intervals the crew leaves to find other work. A crew member is often expected to help with minor repairs and maintenance in port. If he is paid at all for this work it would be close to minimum wage.

Finally, a crew member's pay depends directly on the boat's catch and market price at the time the catch is delivered. Boats and skippers with a reputation for being successful have an easier time finding and keeping their crew.

As a result, many crew members see no future for themselves in bottomfishing. They can see that no matter how hard they may try to save their pay the cost of buying a commercial fishing boat is beyond their ability.

PROSPECTIVE SOLUTIONS TO THE BOTTOMFISH MARKETING DILEMMA

Freezing the catch

The prospects of developing freezing facilities and the marketing of frozen products have been topics of frequent discussion at the state level in recent years. However, freezing does not seem to provide the solution to the bottomfisher's problems. First, the prices of frozen products are much lower than for fresh fish. Second, most of the present bottomfishing fleet is not equipped to freeze their catch. For a high quality frozen product, the fish need to be frozen the same day it is caught. Even if there were a good outlet for frozen fish the best these boats could do if they return to port and find low prices would be to freeze their catch from the last day's fishing. Boats with freezing facilities also face a dilemma. They must freeze each day's catch to have a good product. Yet, they cannot know if prices will be low until they get back to the dock or to the auction block.

Operational strategies to maximize earning

The bottomfisher must have a personal strategy of operation to maximize profits. Catch can usually be increased by traveling farther to less-fished areas or by staying at one fishing ground for longer periods. The fixed costs of fuel and traveling time are spread over the larger catch, thereby decreasing the average cost per pound of fish. However, a large catch may be more than the auction block can absorb on a given day, thereby lowering the price and negating the extra fishing effort. The decision to fish at a more distant site or to spend more days fishing must be weighed against possible losses in price as a penalty for delivering too large a volume or due to lowering of flesh quality for the earlier part of the catch. Finally, even a highly successful trip with the fish kept in excellent condition can produce low returns if other boats have brought in more than the market will absorb at prices normally realized for that time of year.

Cooperatives

Many feel cooperation and regulation of the amounts of fish offered for marketing is the answer. On at least two occasions, several bottomfishers organized themselves into a cooperative with hopes of stabilizing prices for their catch. If a bottomfishing boat should return just after a large catch is brought in, it would receive far less income than under different circumstances. And since all boats are in this position at times, there are some incentives for fishers to organize and try to equitably stabilize income. Those in the co-op agreed to land only a limited poundage of certain species on any day. This means that if the co-op boats land more than the limit of, say, 1,000 pounds of aku, then they would only sell 1,000 pounds at the auction that day. By some rule, they would divide that day's sales among themselves and hold the rest for the following day.

This policy in turn would mean fishers, while at sea, should stop fishing a certain species after a large amount has been caught.

The co-ops were always short-lived for many reasons. The restrictions were much harder to enforce than those that successfully bind aku fishers. When some boats abided by the marketing quotas, thereby raising prices, another boat would take more than the daily limit to auction and profit by the supply limits. Co-op members also sold larger quantities of fish directly to wholesalers and retailers. These sales were especially hard to monitor and took advantage of the higher prices. Finally, there apparently were never enough co-op members, even if they had abided by the rules, to effectively restrict supply. In an industry segment with easy entry, non-member boats could always increase bottomfishing effort and negate supply cutbacks.

In sum, the inability of the market to absorb the catch at relatively stable prices has meant volatility of supply, price, and income, and emphasis on tactical planning to increase income -- such as timing one's return, concealing quantity, and location of catch.

AKU FLEET REVENUES AND COSTS

The 12 aku boats that dock at Kewalo Basin form virtually the entire aku fleet in Hawaii. They are a diverse group. Some boats have been fishing 40 years longer than others and some have three times the fish-holding capacity of others. The detailed cost and revenue data available, covering several of the newer boats, were aggregated and averaged to present a picture of a successful boat 70 to 75 feet in length with 11 crew members.

The hypothetical boat, presented in Table 5, landed about 25 percent more fish than the average Kewalo Basin aku boat. In 1981, the 11 Kewalo aku boats landed about 5.6 million pounds of aku. These boats which were active all year landed about 500,000 pounds each versus the 637,000 pounds landed by the hypothetical boat. The boat in Table 5 received the average industry price of \$.80 per pound for its fish; its revenue for the year was just over \$500,000. Operating expenses, before the boat and crew shares were deducted, made up 29 percent of the gross revenue. The percentage of operating expenses to revenue was almost identical to that of the bottomfishing boats discussed earlier.

While the exact number of trips taken by aku boats could not be established, 135 trips per boat per year is a close estimate. Ahsan et al. found in 1972 that aku boats averaged 138 trips per year during a 4-year period. Aku boat skippers today estimate that they are at sea 9 months of the year and spend a little more than 50 percent of that time fishing and the rest catching bait: 9 months x 30 days = 270 days, 270 days x 1/2 = 135 days. From records of ice purchases and aku sales, a range of between 129 and 141 trips for the boats under study can be estimated.

TABLE 5. GROSS REVENUE AND OPERATING EXPENSES FOR A HYPOTHETICAL AKU BOAT OPERATING IN 1981 (Assuming 135 Trips)

	Per Trip	Total	% of Revenue
Gross revenue			
Catch (pounds of fish)	4,722	637,470	
Price per pound	\$.80	\$.80	--
TOTAL	\$3,778	\$509,976	
Operating expenses			
Fuel	--	85,703*	16.9
Auction commission	--	31,085	6.1
Ice	--	5,606+	1.1
Health insurance	--	5,196	1.0
Crew's yearend bonus account	--	4,489	0.9
State excise tax	--	2,539	0.5
Disability insurance	--	2,256	0.4
Water, car parking	--	920	0.2
Miscellaneous	--	7,566	1.5
TOTAL	--	\$145,360	28.6
Net available for distribution to boat and crew		\$364,616	71.4

*\$635 or 538 gallons at \$1.18/gallon

+\$42 or 12 to 300-pound blocks at \$3.50 each

At 135 trips per year, the average yield per trip is 4,700 pounds of aku. The range of catches is very large, with several landings of over 30,000 pounds recorded in 1981. About 4 percent of an aku boat's catch is actually of other species, mainly ahi taken incidentally while catching aku. Some boats will also troll at times, especially when aku fishing is slow.

Fuel cost

As Table 5 shows, fuel consumes about 17 percent of an aku boat's revenues. This is up substantially from the 10 percent estimated in 1979 in the Hawaii Fisheries Development Plan. Although diesel fuel is a large cash expense for aku boats, its actual importance as a percentage of actual fishing costs may be

exaggerated since financial data ignore the fishing time lost by netting nehu for bait.

Boat share

Returning to the hypothetical aku boat operating in 1981, the \$364,000 remaining after the operating shares in (Table 5) are split roughly 60 to 40 percent between the crew and boat; the shares come to approximately \$211,000 and \$154,000, respectively (Table 6). The boat share must also pay for such expenses as (1) Kewalo docking fees, (2) state unemployment compensation, (3) Social Security owner's tax, (4) installment payments, for dry-docking and certain repairs, to Hawaiian Tuna Packers, (5) some health and life insurance payments, and (6) payments to the skipper and engineer (a fixed percentage of boat share, between 6 to 8 percent and 2 to 3 percent, respectively).

TABLE 6. AKU BOAT EARNINGS DISTRIBUTION TO BOAT AND CREW

	%	Amount
Available for distribution (from Table 5)	100	\$364,616
Boat share	42.25	\$154,050
Boat share expenses	--	63,775
To boat owner	--	90,275
Hull insurance	--	12,000
Liability insurance	--	12,000
Profit, less principal and interest on boat purchase, if any	--	\$ 66,275
Crew share	57.75	\$210,566
Individual share (11 crew members)	--	19,142
Meals	--	878
Net before taxes, FICA	--	18,264

After these expenses, the boat owner is left with about \$89,000. Payments on the boat, if any, and hull and liability insurance must be subtracted. An aku boat valued at about \$300,000 will have a yearly hull insurance premium of about 4 percent of the value, or \$12,000. Liability insurance would likewise be about \$1,000 a month, or \$12,000 per year. Ignoring principal and interest payments, the boat owner could have netted about \$66,000 in 1981. This would be a return of 13 percent on gross sales and 22 percent on the boat if it is valued at \$300,000.

Crew share

There were usually 11 crew members on each trip, although on rare occasions the number went as low as 8 and as high as 14. The crew share is divided equally unless a person is new; in the latter case, the newcomer usually receives less for a period of time. The range of wages for experienced crew on the boats that were surveyed was \$15,210 to \$21,746 in 1981. The skipper, who is also the boat owner, receives a crew share, plus 6 to 8 percent of the boat share before other boat share expenses, plus a portion of the boat share after all expenses in proportion to ownership.

There has been some discussion of the difficulty of getting local people to work on the fishing boats and the increasing reliance on Okinawan labor. However, in interviews at Kewalo, it was learned that only 4 of the 12 boats employ any Okinawans, and of the approximately 130 men who work on the aku boats, only 29 are Okinawan.

MARKETING AKU

The 12 aku boats each belong to one of two aku boat associations. Eight belong to the Hawaiian Tuna Boatowners' Co-op, and four are associated with the United Fishing Agency. Each association handles the sales of aku to fresh-fish outlets and to the tuna cannery for their members.

Fresh market sales are usually completed in the following manner. Based on the recent price of fresh aku, wholesalers and retailers will place an order, usually daily, with the intermediary in each association who manages these transactions. Most buyers deal with only one or the other association because when supplies of aku are short, they are more likely to get the requested amount if they are regular customers. After the boats land their catch at night, the quantity and size of the fish available are determined by the association intermediary. Based on the amount ordered and the amount caught, the intermediary sets the association's price for selling each of the five sizes of aku on that day. In the early morning, the intermediary tells the buyer by phone what the day's actual prices are. The availability of the requested sizes of fish is confirmed or, if not available, alternative sizes are agreed on, and the tentative order is finalized. The aku is loaded from refrigerated lockers into tubs and trucked to the buyer before the start of business. Aku not sold to the fresh-fish market is sold to the cannery at established prices.

Both associations allocate sales to the fresh-fish market among their member boats as evenly as possible. If 6,000 pounds of large aku are ordered from one of the associations, and one boat catches 3,000 pounds of large aku, a second boat 4,000 pounds, and a third 5,000 pounds, each will be credited with

2,000 pounds of sales to the fresh-fish market and the remainder sold to the cannery. A boat is never credited with more than it has caught, so if the catches had instead been 1,000, 5,000, and 7,000 pounds, credit would be given for sales of 1,000, 2,500, and 2,500 pounds, respectively.

This agreement tends to equalize earnings among boats in an association since a boat usually cannot sell its whole catch to the fresh-fish market. Therefore, if two boats sell equal amounts to the fresh-fish market which exactly consumes all the catch of one boat, the second boat will have to catch three times as much aku in order to double the first boat's earnings. The average percentage of fish that several boats were able to sell to the fresh-fish market is shown by month in Table 7.

TABLE 7. PERCENTAGE OF AKU SALES TO THE FRESH-FISH MARKET AND CANNERY, 1981

Month	Fresh-Fish (%)	Cannery (%)
January	90.5	9.5
February	96.0	4.0
March	76.8	23.2
April	55.4	44.6
May	49.1	50.9
June	40.4	59.6
July	44.1	55.9
August	39.8	60.2
September	64.2	35.8
October	93.1	6.9
November	100.0	0.0
December	83.9	16.1
AVERAGE	69.4	30.6

Note: Data are for part of the aku fleet only. Percentage figures are based on poundage.

Table 8 shows that in 1981, which saw the second lowest catch figure in the past decade, all 12 boats were still only able to sell a little over 50 percent of their catch to the fresh-fish market. But the fresh fish produced 73 percent of boat earnings. Over the entire year, an average of about 8,800 pounds of fresh aku were consumed in Hawaii per day. However, as Table 9 shows, in June of 1981 almost twice that amount was consumed daily.

TABLE 8. POUNDS AND REVENUE DATA FOR FRESH AND CANNED AKU, 1981

	Amount	%	lb/day
Can pounds	2,408,180	43	6,598
Fresh pounds	3,203,440	57	8,777
TOTAL	5,611,620		15,375
Can revenue	\$1,210,802	27	
Fresh revenue	3,308,740	73	
TOTAL	\$4,519,542		
Can revenue/lb	\$.50/lb		
Fresh revenue/lb	1.03/lb		
TOTAL	\$.81/lb		

Note: Data given for all boats surveyed

TABLE 9. FRESH AKU SALES, 1981

Month	Total Pounds	Total Revenue	\$/lb	lb/day
January	150,033	\$ 178,484	\$1.19	4,840
February	120,424	166,455	1.38	4,301
March	242,671	318,885	1.31	7,828
April	257,708	282,802	1.09	8,590
May	347,705	322,235	.92	11,216
June	497,480	447,871	.90	16,583
July	387,333	315,637	.81	12,495
August	345,782	297,349	.86	11,154
September	267,087	230,687	.86	8,903
October	200,020	223,540	1.12	6,452
November	168,169	208,706	1.24	5,606
December	219,028	316,089	1.44	7,065
TOTAL	3,203,440	\$3,308,740	--	--
AVERAGE	--	--	\$1.09	8,753

Note: Data given for all boats surveyed

For historical interest, Table 10 shows the yearly average price for fresh aku. In the past 10 years, the price of fresh aku has increased 119 percent. In the 3 years since 1978, the price rise has slowed, increasing only 10 percent. Interestingly, the Iranian oil cutoff and a doubling of diesel prices occurred in this period.

TABLE 10. ANNUAL AVERAGE PRICE FOR FRESH AKU, 1971-81

Year	Price Per Pound	Change (%)
1971	\$.47	--
1972	.53	+ 13
1973	.58	+ 9
1974	.60	+ 3
1975	.63	+ 5
1976	.67	+ 6
1977	.78	+ 16
1978	.94	+ 21
1979	.92	- 2
1980	1.05	+ 14
1981	1.03	- 2
	1.03/.47 = ?	+119

Cannery prices for aku rose far more than fresh prices in the 10-year period 1971-81 (Table 11). The price for the largest four sizes increased an average of 297 percent, well over twice as much as that for fresh aku. Even including the 1982 price drop, the price for the four largest sizes increased 240 percent.

The difference in the rate of price increase between fresh and cannery aku means that the percentage price differential has narrowed in the past decade. Since fresh-fish prices were not available by size, cannery prices are compared in two sizes to fresh aku prices. In 1971, fresh-fish prices were 3.5 times the medium aku cannery price; by 1981, they were only twice the price of medium aku going to the cannery (2.5 times in 1982). In 1971, fresh-fish prices were over 7 times the cannery price for extra small aku; in 1981, the ratio was just over 3 times.

The reasons for the narrowing differential are hard to ascertain without more detailed data but may be due to a larger fraction of the aku catch going to the fresh-fish market in recent years. This policy would restrain price increases for fresh fish while also raising boat revenues during the relatively poor catches of the years from 1979 to present. (During 8 of the 10 years from 1969 through 1978 catch figures were better than in any year since 1978.)

TABLE 11. PRICES PAID BY HAWAIIAN TUNA PACKERS FOR AKU

Date	Large (> 15 lb) (\$/ton)	Medium (8 to 15 lb) (\$/ton)	Small (4 to 8 lb) (\$/ton)	Extra Small (3 to 4 lb) (\$/ton)	Extra, Extra Small (< 3 lb) (\$/ton)
04/07/69	\$ 265 = \$.1325/lb	\$ 235	\$225	\$130	\$22
04/01/70	280 = \$.14/lb	245	230	130	22
04/11/71	320 = \$.16/lb	270	240	140	22
04/01/72	365 = \$.1825/lb	300	270	160	22
04/01/73	405 = \$.2025/lb	335	300	180	22
04/01/74	495 = \$.2475/lb	410	360	210	22
04/02/75	415 = \$.2075/lb	360	305	200	22
04/01/76	540 = \$.27/lb	480	420	200	22
03/16/77	620 = \$.31/lb	550	480	250	22
04/01/77	620 = \$.31/lb	560	495	250	22
06/27/77	730 = \$.3650/lb	650	570	300	22
07/13/77	730 = \$.3650/lb	660	595	300	22
11/02/77	765 = \$.3825/lb	700	640	320	22
05/12/78	790 = \$.3950/lb	725	655	335	22
06/01/79	805 = \$.4025/lb	740	670	350	22
02/01/80	1,100 = \$.55/lb (+37%)	1,035	965	645	22
06/21/82	890 = \$.4450/lb (-19%)	825	755	645	22

Table 12 shows partial catch data by size of fish for 1980 and 1981. The number of fish caught was estimated by taking the total pounds of that size caught and dividing by the mid-range of each size category. Large fish were assumed to be 20 pounds each and extra extra small to be 2 pounds each. It is interesting to note that more large than medium fish were caught in 1981. The relative abundance of large and the scarcity of medium fish, at least compared with 1980, may explain why the price of medium fish was higher than that of large fish in 1981. Normally, the higher ratio of meat to bone in large fish makes the reverse true. Note that in both 1980 and 1981, large and medium fish produced a disproportionately large share of revenue for their weight or number.

Another change in relative abundance is that there were almost twice as many small fish as extra small ones in 1980, but in 1981 the catch was almost equal. Finally, note the sharp decline in price of the extra extra small fish from 1980 to 1981, despite a decrease in pounds and number caught. This may be due in part to the very high prices for fresh aku during the early months of 1980; consumers on limited budgets may have bought more of the very small, normally low-priced aku that are sold whole and less of the larger fish that are sold partially filleted.

CONTINUING PROBLEMS IN THE AKU FISHERY

Bait

The availability of bait has been identified as the major bottle neck to the expansion of the Hawaii-based aku fishery. Availability of an acceptable cultured bait would permit expansion of the fishing fleet. It would also increase time available for aku fishing for the present fleet and in some cases reduce crew size. The state of Hawaii, particularly Division of Aquatic Resources, and the Honolulu Laboratory of the Waianae Marine Fisheries have placed high priority on the development of an alternative to the nehu as aku bait and together with the UH Sea Grant College Program, funded a number of research and demonstration programs aimed at achieving this goal. Although several species have been successfully cultured to date, commercial production has not occurred.

Possibility of cannery closure

The second major concern is the future of the tuna cannery. The cannery, Hawaiian Tuna Packers, owned by Castle and Cooke, Inc., is relatively small and old.

TABLE 12. AKU BY SIZE OF FISH -- RELATIVE ABUNDANCE AND PRICE -- PART OF FLEET ONLY

Size of Aku By Year	% of Total By Pounce	% of Total By Estimated No. of Fish	% of Total Revenue	Average Price Per Pound
1980				
Large (> 15 lb)	31	13	38	\$1.02
Medium (8 to 15 lb)	36	25	37	.85
Small (4 to 8 lb)	22	30	17	.64
Extra small (3 to 4 lb)	7	16	5	.56
Extra, extra small (< 3 lb)	4	15	3	.72
	100	100	100	.83
1981				
Large	44	18	46	.85
Medium	20	14	28	1.15
Small	22	30	18	.66
Extra small	12	29	7	.49
Extra, extra small	2	9	1	.33
	100	100	100	\$.81

The fate of the cannery and the boat repair yard run by Hawaiian Tuna Packers are tied closely together. The repair facility has been adversely affected by the current recession as pleasure-boat owners, on which the facility heavily relies, have postponed drydocking. The losses here make the continuation of the cannery operation less attractive.

Finally, Honolulu's cannery may not be well positioned to survive because its tuna is oil-packed rather than water-packed. Oil-pack is the only way skipjack tuna is marketed. A 30 percent duty on oil-packed tuna imported to the United States has helped to protect the local cannery by making foreign oil-packed tuna more expensive. However, calorie-conscious American consumers are increasingly coming to prefer water-packed tuna, decreasing the need for Hawaii's type of canned tuna. Hawaiian Tuna Packers could start producing more water-packed, white-meat tuna. But then, operating a cannery on foreign soil may look more attractive because instead of a 30 percent duty, water-packed tuna has only a 4 percent duty when imported. Lower wages overseas may offset the 4 percent duty.

In fact, it is this wage differential which led the national director of the union which represents most U.S. cannery workers to say that within 10 or 15 years at most, no tuna canneries will be left in the United States. Mexico is expanding into tuna processing and can pay workers \$1.00 per hour versus the \$4.25 to \$5.00 per hour average paid by Hawaiian Tuna Packers.

Closure of the cannery would release large amounts of additional ahi on the fresh market driving prices down and reducing the fleet size. An alternative would be to freeze and store the surplus catch for transshipment to another canning facility. Some tuna currently canned in Hawaii is caught in the Far East and shipped to Honolulu. The economical viability of this option would depend on cooperation between the association, the costs of freezing, storage, shipping and marketing, and the demand for frozen aku. In any, instance severe adjustments would be required in the fleet and fleet operations.

REFERENCES CITED

- Ahsan, A.E., J.L. Ball, and J.R. Davidson. 1972. Costs and earnings of tuna vessels in Hawaii. UNIHI-SEAGRANT-AR-72-01. University of Hawaii Sea Grant College Program, Honolulu.
- State of Hawaii, Department of Land and Natural Resources. 1979. Hawaii fisheries development plan. Honolulu.

