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ECONOMIC IMPACT OF RECREATIONAL FISHING ON HAWAII[1]

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Hawaii's favorable environment for water-related recreational activities, of which sport fishing is a major category, contributes importantly to the quality of life enjoyed by its residents. The major objective of this paper is to assess the impact of recreational fishing on the Hawaiian economy.

During 1968, telephone interviews were conducted with a large sample of persons selected as representative of residents of the island of Oahu (including military personnel stationed on Oahu). Out of 3996 households interviewed, 1223 reported fishermen. Only 1095 interviews were complete enough to tally up the number of fishermen in the sample. This turned out to be a total of 2302 or an average of 2.1 fishermen per fisherman household. Applying this factor directly to the total number of fishermen households on the island (52,427) results in approximately 110,200 fishermen. This implies that with an Oahu-wide population of about 633,200 one out of every six persons was a recreational fisherman.

FISHERMEN EXPENDITURES

Fishermen expenditures data were grouped in three categories roughly corresponding to three different phases in the total fishing activity. While recognizing that many of the expenditures actually occurred in the initial planning phase, our first category included transportation expenses for getting the fisherman from home to the fishing area. The second category included additional living expenses, i.e., food and lodging, once in the fishing area, and the third category combined all equipment, auxiliary and other miscellaneous expenses necessary for actual fishing.

The empirical findings are listed in Table 1. More detailed accounts of the specific items included under each category follows:

Table 1. Fishermen expenditures by major cost categories.

Cost category	Sample 1047 households	Projected to actual population (dollars)	Percent of total
Transportation	86,596	4,340,200	37.4
Food and lodging	40,572	2,033,100	15.2
Fishing equipment and miscellaneous	104,484	5,237,700	45.1
Total	231,652	11,611,000	100.0

Transportation expenditures, $4,340,000 (37.4%), were the sum of all outlays on all types of transportation (except boat) used as part of a fishing trip. The major component in this category was, as expected, expenditures for automobile transportation which was computed on the basis of a flat 10 cents per mile over total distance traveled. Food and lodging expenditures, $2,033,000 (17.5%), were the sum of all extra outlays made in connection with the fishing activity. These outlays were extra in the sense that they were in addition to any normal living expense of the fishermen and included such cost items as special foods and drinks, camping gear and fees and other accommodation expenses.

Fishing equipment, auxiliary equipment and other miscellaneous fishing expenses accounted for were $5,238,000 (45.1%). The total expenditure for all categories was $11,611,000.

PROJECTING FISHING EXPENDITURES, 1975

Regression analysis was used as an alternative method to derive total expenditures for 1968 and projecting future expenditures in 1975. Out of 1047 questionnaires, 946 were complete enough for the multiple regression analysis.

The aesthetic values that are attached to the sportfishing recreation are hard to quantify. The average fishing days per Oahu fisherman (Y) is hypothesized to be a function of certain explanatory variables, such as: family size (X_1), fisherman's average age (X_2), fisherman's weeks of vacation (X_3), fisherman's average years of residence (X_4), annual cost of fishing per family in dollars (X_5), distance travelled in miles (X_6) and annual family income in dollars (X_7).

A priori, one general linear algebraic form was considered for the study. Single equation estimates of the parameters of the postulated relation between fishing days and the socio-economic characteristics were obtained using multiple regression analysis and empirical findings are the contents of Table 2.

Table 2. Regression coefficients of the estimated equation.

Intercept	X_1	X_2	X_3	X_4	X_5	X_6	X_7	R^2
17.56320	.20703	.13490	-.13316	.08175	.01398*	-.00461*	-.00036	.53
	(.31)	(1.16)	(-.30)	(.89)	(18.89)	(2.98)	(1.06)	

* Significant at 1% level.

( ) Numbers in parentheses are the t ratios.

The assumption underlying the utilization of any cross-section data for future projection is that the underlying structure of the estimated relationship is invariable in the long run. Hence, it is presumed that the fishermen in the future will behave cateris paribus, in a manner similar to their counterparts who possessed the same characteristics or values for the explanatory variables during the sampling period.

If income, population and consumer prices on Oahu from 1968 to 1975 are similar to trends from 1960 to 1967, income can be expected to increase by 18.5%, population by 26% and consumer prices by 23%.

Substituting the mean values of the explanatory variables results in the predicted average fishing days per fisherman in 1968. Adjusting both family income and fishing expenditures upward by 18.5% and 23%, respectively, will result in the projected average fishing days per fisherman in 1975. Multiplying these estimates by the number of fishermen and the fishing expenditures per fishing day results in the total expenditures of $11.6 and $17.3 million for 1968 and 1975, respectively (Table 3).

Table 3. Projection of total expenditures in 1968 and 1975.

	Projected number of			Fishing cost per fishing day (dollars)	Total expenditure (dollars)
Year	Fishing days per fisherman	Fishermen	Fishing days		
1968	29.50	110,201	3,250,929	3.56	11,573,307
1975	28.50	138,823	3,956,455	4.38	17,329,273

ECONOMIC IMPACT OF FISHERMEN EXPENDITURES

The economic impact of fishermen expenditures for recreational fishing is measured in terms of additional income that is generated for a local economy. For this purpose the local multiplier concept is used. This concept is a modification of the more familiar Keynesian income multiplier, with built-in adjustments for various types of leakages from the local economy, such as payments for imports, federal taxes, etc. In algebraic terms, the total expression may be represented as follows:

$$\text{Total income increase} = A \frac{1}{1-BC}$$

Where

A = initial expenditure remaining in local area

B = propensity to spend disposable income locally

C = proportion of expenditures of local people that accrues as local income

Without A and C we can easily recognize the remaining expression as the familiar Keynesian multiplier for the macro-economy, (i.e., $\frac{1}{1-B}$). Both A and C are factors which adjust for leakages from the economy. A adjusts for the types of leakages which are specific to the first round of expenditures by recreational fishermen. Subsequent rounds of expenditures are for general consumption and so must be netted out for leakages which are general to all types of consumption expenditures. As additional income accrues in successive spending rounds, the multiplier is adjusted for income leakages due to imports which are invariably imbedded in the goods and services sold locally. C, the proportion of local expenditures that remains as local income, accounts for this.

While the concept of the local multiplier is clear enough, the precise empirical magnitudes of the parameters involved is another matter. Since our survey data does not provide us with all necessary information, we can at best only try to construct reasonable values with data from published sources as follows:

$$A = .419t + .498n + .419f$$

Where

t = total transportation cost

n = total additional living cost

f = total costs for fishing equipment

The cost coefficients represent that proportion of the respective expenditures which may be expected to accrue to the local economy.[3]

For subsequent spending rounds, local income may be expected to accrue according to the values assigned to B and C. Fortunately, it is reasonable to expect a fair degree of stability over time for both these parameters. For B, the ratio of personal consumption to state disposable income was estimated to be .85 for 1958-1960.[4] For C, in 1960, the weighted average proportion of local income created from 13 different categories of household expenditures was calculated to be .496. Even if household expenditure patterns and local proportions have shifted within the different spending categories since 1960, in the aggregate the weighted average may be still expected to remain near .5. Substituting B = .85 and C = .5 into our expression we have:

$$\text{Multiplier} = \frac{1}{1-.85\ (.50)} = 1.74$$

Hence, the total income increase will be equal to A(1.74), $8,744,500 and $12,877,500 for 1968 and 1975, respectively.

FOOTNOTES

1. Presented at the Annual Meeting of the Western Agricultural Economics Association, July 20, 1970, Tucson, Arizona.

2. Assistant Professor, Department of Agricultural Economics, University of Hawaii.

3. *The Impact of Exports on Income in Hawaii,* Department of Economic Research, First National Bank (now First Hawaiian Bank), 1960, p. 19.

4. Harry T. Oshima and Mitsuo Ono, *Hawaii's Income and Expenditures, 1958, 1959, 1960,* Economic Research Center, University of Hawaii, 1965, chapter 11.