RESOURCE AND ACTIVITY SUBSTITUTES FOR RECREATIONAL SALMON FISHING IN NEW ZEALAND

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ABSTRACT: Substitutes become an issue when people are constrained from participating in desired activities. This study investigates and compares activity and resource substitutes for recreational salmon fishing in New Zealand. Results suggest that resource substitution and inventories need more attention, user perceptions of substitutes are important, substitutes can be asymmetrical, activity substitutes may be hard to find, and substitutability studies need to be integrated with availability studies.

INTRODUCTION

Substitutes become an issue when individuals are constrained from participating in a desired activity. Constraints on participation (Baumgartner 1978) can be externally imposed (e.g. resource areas closed by non-recreational uses) or based on individual limitations (e.g. insufficient time or money to participate). In either case, the individual can compensate by: (1) selecting a different activity which meets particular needs; (2) choosing an alternative resource to continue participation in the original activity; or (3) deferring participation to a more auspicious time (Vaske and Donnelly 1982). The aim of substitutability research is to understand the constraints people face and their subsequent compensatory processes.

The most common approaches to recreation substitutability correspond to the first two compensatory processes. Accordingly, substitutes have been identified between recreation activities and between recreation resources or sites. The former has received the most attention.

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Activity Substitutes

The most commonly accepted definition of activity substitutability is "the interchangeability of recreation activities in satisfying people's needs, motives, and preferences" (Hendee and Burdge 1974). Factor or cluster analyses have generally been used to construct activity groupings based on empirical intercorrelations. The measures employed in the analysis include participation rates (e.g. Moss and Lamphear 1970), reported preferences (e.g. Chase and Cheek 1979), and perceived similarities between pairs of activities (e.g. Becker 1976).

Activity groupings have also been based on the kinds of satisfaction sought by participants (Tinsley and Kass 1978; Hawes 1978). Measures of "satisfaction" such as getting along with others or utilizing abilitites are factor or cluster analyzed to create groupings that are similar in terms of the satisfactions they provide. The assumption is that activities satisfying similar needs are substitutable.

Activity groupings have also been formed on the basis of the social groups with which an individual participates (e.g. Field and O'Leary 1973). The assumption here is that the basis for participation may lie in the social group experience rather than the activity itself. Activities within groupings are considered interchangeable because they provide the same type of group experience.

The assumption in all these approaches is that because activites are intercorrelated on one of these dimensions they must provide similar satisfations and are therefore substitutable. Although this makes sense at some levels, some researchers have argued that even similar activities may not provide the same satisfactions, depending on factors such as the activities in question, the "style" in which they are performed, and/or the characteristics of the user. In addition, intercorrelated activities may be complementary rather than substitutable.

For example, Christensen and Yoesting (1977) used four activity types (games and sports, hunting and fishing, nature appreciation, and motorized activities) from an earlier study to see if respondents considered other activities within an activity type to be good substitutes. On the average, only 60 percent of respondents could substitute within an activity type; activities in the games and

sports type were most substitutable (almost 70 percent), while those in the hunting and fishing type were least so (45 percent).

In a study of two hunting activities similar in form, Baumgartner and Heberlein (1981) found that deer hunters perceived fewer substitutes than goose hunters, apparently because deer hunters placed more importance on the process of participation, the goal of the activity, and social interaction. It appears that activities will have fewer substitutes if numerous elements of a specific nature are rated important by participants. The results suggest that research on activity substitutes must consider the experiential elements of activities.

Vaske and Donnelly (1981) compare the activity type approach to a "direct question method" where respondents were simply asked to specify substitutes for a particular activity. Maryland turkey hunters who were displaced by season closure were asked to: (1) specify participation rates in a number of recreation activities (activity type method); and (2) indicate three substitutes for turkey hunting (direct question method). The activities predicted as substitutes by the activity type method accounted for only 15 percent of the activities specified as substitutes by the direct question method.

Resource Substitutes

A problem with the activity substitutes approach is that it often overlooks the physical context in which activities take place. None of these approaches focus on the resource itself, which is what managers can often manipulate most directly.

Economists have studied substitutes and complement relationships for years (Clawson 1966:90), although there are few empirical studies in the recreation field. Cordell (1976) explored the substitutability of public and private open space in urban areas. Demand for private recreational open space was significantly related to price of private space, quantity of public space, income, and two measures of the quality of private outdoor space (the proportion of land with creeks and golf courses). Income was the variable with the greatest effect, although Cordell argues that willingness to substitute has an effect independent of ability to substitute.

In a study more closely related to rural areas, Kurtz and King (1979) explored substitute and complement relationships for motorboat use of reservoirs in Arizona. Relationships were shown as cross-elasticities of demand, based on equations predicting the number of trips to each area from the costs (on and off site) of participation at each area. Results were explained in terms of characteristics of the individual reservoirs such as proximity to urban centers, access, travel time, travel distance, size of reservoir, facilities available, activities (fishing, water skiing, or cruising) and engine horsepower. Income was not a significant factor in explaining participation rates, presumably because the proportion of income spent on boating at the reservoir was small.

These studies suggest the kinds of factors that might affect the substitutability of resources. The specific variables would change from one area to another, but issues such as access, facilities or developments for recreation, other resource uses besides recreation, perceived site impacts, use density, conflicting recreation uses, and the regimentation of rules and regulations, need to be considered from the resouce point of view.

METHOD

The Rakaia and Waimakariri Rivers are located on New Zealand's South Island, flowing southeasterly out of the Southern Alps across the Canterbury Plain to reach the sea near Christchurch. These rivers have many of the same physical attributes and appear to offer similar recreational amenities. Both rivers have water right applications pending for large-scale irrigation development, and both are likely to be nominated for preservation under the new "Wild and Scenic Rivers" amendment to the New Zealand Soil and Water Conservation Act. These alternative uses are incompatible, and the possibility of a compromise solution depends partly on whether the two rivers are close substitutes and one could accomodate a shift of use from the other.

In this study, resource substitutability was approached from two points of view (see Shelby [1983] for a more complete description of the study). First is a review of existing information on resource characteristics describing the Rakaia and Waimakariri. These include river bed and catchment, geology, climate, proximity to population centers, travel times, road accesses, current recreational activities, regulations affecting recreation, agencies, river flow, fishery and fish habitat, and developments and facilities. The two rivers are compared in terms of these variables by organizing data already available.

The second source of information about resource substitutability is a questionnaire distributed to fishermen on both rivers. In order to determine their first hand knowledge about substitutes, fishermen were asked which of the ten South Island salmon rivers they had fished before. Fishermen then indicated which rivers were acceptable substitutes. For those considered not acceptable, they indicated the reasons why not. Finally, fishermen were asked to specify the "best" substitute river and evaluate this river in relation to the Rakaia or Waimakariri.

Activity substitutes were determined in two ways. Possible substitute fishing activities were presented in a list; respondents simply circled "yes" or "no" to indicate whether each was a substitute for salmon fishing and then indicated the location where the activity would take place. Fishermen were also asked to list the non-fishing activities that gave them the same type of satisfaction or benefit they got from salmon fishing.

Finally, level of commitment to an activity and knowledge of substitutes have been shown to affect substitutability. Commitment to salmon fishing was measured in terms of years spent salmon fishing, length of time spent on an average visit, where the respondent stayed on overnight trips, and a general item indicating the degree of personal involvement with salmon fishing. Knowledge of substitutes was measured by asking about fishing experience on other South Island salmon rivers.

Questionnaires were distributed on weekend days in February when the river was fishable and fishermen were present. An effort was made to contact all fishermen below the Gorge Bridge on sampling days, using vehicle access points, jet boats, and kayaks. The samples are thus drawn from fishermen present on fishable weekend days in February.

Of the 367 questionnaires distributed on the Rakaia, 146 were completed and returned, a response rate of 40 percent. Of the 400 questionnaires distributed on the Waimakariri, 121 were completed and returned, a response rate of 30 percent. The ability to send follow-up reminders would certainly have increased response, but because of limited resources, names and addresses of respondents were not obtained. Although disappointing, these response rates are close to what can be expected from a one-shot distribution effort under these kinds of conditions.

It is difficult to specify the extent to which the samples represent all Rakaia or Waimakariri fishermen because response rates are low and the samples represent only those present on fishable weekend days in February. We have no reason to conclude that these two factors bias the study findings, but that possibility does exist, and the results presented here should be viewed as suggestive rather than conclusive.

RESULTS

Substitutability Based on Resource Characteristics

The resource assessment revealed both similarities and differences. The rivers are similar in terms of length, channel, distance from the Gorge Bridges to the sea, geologic areas, and rainfall and climatic patterns. They serve much of the same populated area by the same highways, and are clear and fishable on roughly the same days. The rivers are different in that the Rakaia has a higher catchment, greater flow, wider braided channel, shorter gorge, greater distance from State Highway 1 to the sea, and lacks the extensive stop banks and facility development found on the lower Waimakariri. The Rakaia is farther from the Christchurch metropolitan area and has less road access in the area below the Gorge Bridge. The salmon run in the Rakaia has at least twice as many fish as the Waimakariri.

Fishermen's Perceptions of Substitutablity for the Rakaia

Rakaia fishermen were given a list of South Island salmon rivers and asked to indicate which ones were acceptable substitutes for salmon fishing on the Rakaia (see table 1). Over 70 percent agreed that the Waiau, Hurunui, Opihi, Waitaki, Clutha, and Rangitata were not acceptable substitutes. For these rivers the most common reason (given by 59-91 percent of respondents) was that the drive takes too long. Some fishermen (26-40 percent) also indicated that it is too expensive to fish on these rivers. A substantial number (36-46 percent) added low salmon numbers as the reason why the Waiau, Hurunui, and Opihi were not acceptable substitutes.

The Ashley and Ashburton Rivers were not acceptable substitutes for 100 percent and 88 percent of the fishermen, respectively. However, the length of the drive was less likely to be a

Table 1.--Rakaia fishermen's evaluations of possible substitutions for the Rakaia

Rivers	Substitute for Rakaia	If not, why? (percent checked)					
	(percent "no")	Drive Takes too long	Too expensive	Too crowded	Scenery not as good	Fewer salmon	Poor fishing conditions
Waiau	99	79	31	1	3	46	19
Hurunui	86	63	26	0	4	44	17
Opihi	94	61	28	10	7	36	44
Waitaki	95	88	35	2	0	16	11
Clutha	100	91	40	1	0	21	9
Rangitata	73	59	26	12	2	22	16
Ashley	100	32	13	3	9	55	55
Ashburton	88	26	12	16	9	46	53
Waimakariri	55	17	7	40	13	26	19

problem (26-32 percent checked this reason). For these rivers, 45-55 percent cited fewer salmon and 53-55 percent cited poor fishing conditions as reasons why they were not acceptable substitutes.

It is often assumed that fishermen can substitute the Waimakariri for the Rakaia. Of the Rakaia fishermen surveyed, 50 percent said the Waimakariri is not an acceptable substitute. The most common reason (given by 40 percent of respondents) was that the river is too crowded, followed by fewer salmon (26 percent), and poor fishing conditions (19 percent).

Rakaia fishermen were asked to choose the river which for them was the best substitute for the Rakaia. As the preceding data would suggest, almost half (46 percent) chose the Waimakariri, while 28 percent chose the Rangitata. None of the other rivers was chosen by more than 3 percent of the respondents, and 18 percent refused to choose a "next-best substitute," saying there was no substitute for the Rakaia.

In order to assess trade-offs between the Rakaia and Waimakariri, we asked Rakaia fishermen to indicate how many days of salmon fishing on their substitute river were required to give the same enjoyment as they got from one day on the Rakaia. Responses for those who chose the Waimakariri or Rangitata are shown in table 2. Only 12 percent said they were willing to give up one day on the Rakaia for one-half to one day on the Waimakarira; 31 percent would need one and one-half to two days on the Waimakariri; 28 percent would need three to five days, and 30 percent would need six or more. For those who chose the Rangitata, 15 percent would need one-half to one day, 39 percent would need one and one-half to two days, 27 percent would need three to five days, and 18 percent would need six or more. These results indicate that in general the Waimakariri and the Rangitata are not "equal" in value to the Rakaia for those who consider them the best substitutes.

Rakaia fishermen were also asked if any other fishing activities would give them the same satisfaction or benefit they got from salmon fishing (see table 3). Sea fishing was not a substitute for 84 percent, and lake salmon fishing was not a substitute for 85 percent. Flounder and perch fishing were unacceptable for 94 percent and 99 percent, respectively. Trout fishing did provide the same type of benefit for 50 percent of Rakaia fishermen, but in a separate item 62 percent indicated that "For me no other fishing is a substitute for salmon fishing." Trout fishing may provide similar benefits for some, but the majority still contend that other types of fishing are not substitutes for salmon fishing.

Rakaia fishermen were asked if any non-fishing activities would give them the same satisfaction or benefit they receive from salmon fishing. Approximately 80 percent listed no substitute activities and indicated that "For me no non-fishing activity is a substitute for salmon fishing." Fourteen percent listed one substitute activity, and 5 percent listed two.

Fishermen's Perceptions of Substitutability for the Waimakariri

Waimakariri fishermen were given the same list of South Island salmon rivers and asked to indicate which ones were acceptable substitutes for salmon fishing on the Waimakariri (see table 4). Over 75 percent agreed that the Waiau, Hurunui, Opihi, Waitaki, Clutha, and Rangitata were not acceptable substitutes. For these rivers, the most common reason (given by 66-91 percent of respondents) was that the drive takes too long. Some fishermen (38-52 percent) also indicated that it is too expensive to fish on these rivers. A substantial number (25-39 percent) added that there were too few salmon in the Waiau, Hurunui, and Opihi.

The Ashley was not an acceptable substitute for 88 percent of Waimakariri fishermen, primarily due to fewer salmon (61 percent) and poor fishing conditions (56 percent). The Ashburton was not a substitute for 85 percent of Waimakariri fishermen. The most common reason (52 percent) was the length of the drive, but expense (32 percent), fewer salmon (30 percent), and poor fishing conditions (38 percent) were also cited as problems.

The Rakaia was an acceptable substitute for 80 percent of the Waimakariri fishermen. For those who said it was not, the major reason was the length of the drive.

Table 2.--Trade-offs between the Rakaia, Waimakariri, and Rangitata

	Days on Waimak to equal one day on Rakaia	Days on Rangitata to equal one day on Rakaia	Days on Rakaia to equal one day on Waimak
One-half to one	12	15	56
One and one-half	31	39	16
Three to five	28	27	18
Six or more	30	18	10
TOTAL	100% (58)	100% (33)	100% (88)
Average	5.5 (3-4 days)	4.7 (2-3 days)	3.4 (1-1/2 - 2 days)

Table 3.--Substitute fishing activities for Rakaia and Waimakariri fishermen

Fishing activities	Substitute for salmon fishing? (percent "no")		Z-value
	Rakaia Fishermen	Waimak Fishermen	
Sea fishing	84	74	2.0*
Lake salmon fishing	85	78	1.4
Flounder fishing	94	92	.9
Perch fishing	99	96	1.8
Trout fishing	50	44	1.0

* means are significantly different, p § .05.

Table 4.--Waimakariri fishermen's evaluations of possible substitutes for the Waimakariri

Rivers	Substitute for Rakaia	If not, why? (percent checked)					
	(percent "no")	Drive takes too long	Too expensive	Too crowded	Scenery not as good	Fewer salmon	Poor fishing conditions
Waiau	94	76	44	0	0	36	18
Hurunui	81	66	38	0	0	36	18
Opihi	96	78	40	5	4	25	21
Waitaki	96	91	46	3	0	3	3
Clutha	100	93	52	0	0	11	8
Rangitata	76	68	38	9	2	4	4
Ashley	88	12	9	3	2	61	56
Ashburton	85	52	31	17	7	30	38
Rakaia	20	28	16	7	1	0	3

In order to assess the trade-offs between the Waimakariri and the Rakaia, we asked Waimakariri fishermen to indicate how many days of salmon fishing on their substitute river were required to give the same enjoyment as they got from one day on the Waimakariri. Responses for those who chose the Rakaia are shown in table 2. The majority (56 percent) said they were willing to give up one day on the Waimakariri in return for one day or less on the Rakaia; 16 percent would need one and one-half to two days on the Rakaia, 18 percent would need three to five days, and 10 percent would need six or more. These results suggest that the Rakaia is more nearly equal in value for the Waimakariri fishermen than the Waimakariri is for the Rakaia fishermen.

Waimakariri fishermen were also asked if any other fishing activity would give them the same satisfaction or benefit they receive from salmon fishing (table 3). Sea fishing was not a substitute for 74 percent, and lake salmon fishing was not a substitute for 78 percent. Flounder and perch fishing were not substitutes for 92 percent and 96 percent, respectively. Trout fishing did provide the same type of benefit for 56 percent of Waimakariri fishermen. In a separate item, 38 percent indicated that "For me no other fishing is a substitute for salmon fishing."

Waimakariri fishermen were asked if any non-fishing activities would give them the same satisfaction or benefit they got from salmon fishing. About 65 percent listed no substitute activities and indicated that "For me no non-fishing activity is a substitute for salmon fishing." Twenty-six percent listed one substitute activity and 5 percent listed two.

In summary, most Rakaia and Waimakariri fishermen agreed that the Waiau, Hurunui, Opihi, Clutha, and Rangitata are not substitutes, primarily because the drive is too long. Both groups agree that the Ashley and Ashburton are not acceptable substitutes, primarily due to fewer fish and poor conditions, although more Waimakariri fishermen (probably those who live north of Chirstchurch) felt the Ashburton was too far to drive. Most Waimakariri fishermen felt the Rakaia was an acceptable and nearly equal subsitute, but only half the Rakaia fishermen felt the Waimakariri was a substitute, and of lower value at that. Most objections to the Waimakariri centered around crowding and fewer fish. Waimakariri fishermen were a little more likely to view other

activities, both fishing and non-fishing, as substitutes for salmon fishing.

DISCUSSION

Findings presented here suggest several interesting issues for substitutability research. First, what is the relative importance of resource substitutes versus activity substitutes? Activity substitutes have received the most attention, primarily at a theoretical level. But from a management point of view, resource substitutes may be more important. If constraints on participation are externally imposed (as when, a resource area is closed by non-recreation uses), public agencies may be obligated to provide an alternative setting which offers the same activity. It may not be enough to displace users and simply say "they can participate in other recreation activities." It is also possible that what were previously assumed to be called activity substitutes or replacements are really activity complements or alternatives, as discussed below. This issue needs further attention.

Second, studies of resource substitutes need to include careful inventories. Studies by economists (Cordell 1976; Kurtz and King 1979) have suggested the importance of variables describing important resource characteristics, and those assessed in the present study add to the list. Variables such as costs, proximity to population centers and user groups, access, travel times and distances, size of recreation area, climate, physical and geographic characteristics, activities possible, facilities available, and level of development should at least be considered. It may be that resources which appear similar at first glance are quite different when the details are known, as was found with the Rakaia and Waimakariri.

Third, information about resource characteristics needs to be interpreted in light of corresponding information about user perceptions of those characteristics. In the present study, for example, information about fishermen's perceptions of substitutes showed that driving time was more often a problem than expense. Crowding and the quality of scenery were less often cited as problems, although it is not clear whether this is because fishermen don't care about these two factors or because conditions are fairly comparable on most of the New Zealand rivers studied. (The latter explanation is suggested by finding that the most heavily used river, the Waimakariri, was the one where a large proportion of fishermen cited crowding as a problem.) The point is that perceptions provide the evaluative dimension needed to determine the importance of objective differences.

Fourth, resource substitutes are not necessarily symmetrical. The majority of Waimakariri fishermen felt the Rakaia was an acceptable substitute, but Rakaia fishermen did not feel that way about the Waimakariri.

Fifth, findings presented here suggest that different (non-fishing) activities are not good substitutes. This casts doubts on some of the activity groupings reported in earlier studies and suggests that intercorrelated clusters may represent alternatives or complements rather than substitutes. In addition, the present study shows that some forms of the same activity are not good substitutes, reinforcing the findings of earlier studies (Christensen and Yoesting 1977; Baumgartner and Heberlein 1981). The definition of the substitutability concept is particularly important here. For example, Vaske and Donnelly (1981) asked displaced turkey hunters what they would do "instead," which could include complements or alternatives as well as true substitutes or replacements. In the present study, we asked if other fishing and non-fishing activities would give "the same type of satisfaction or benefit," a more restrictive definition of a true substitute.

Finally, we need to integrate substitutability studies with "availability" studies of use levels and carrying capacities. Even if a substitute resource can be found and users perceive it as such, we need to know if the new area can accommodate a shift in use. This requires knowledge of the current use levels in both areas and the capacity of the new area. In the Rakaia and Waimakariri, for example, most fishing areas were already at or above capacity, and neither river could accommodate a major shift of use (Shelby 1983). This adds another dimension to the problem of actually providing substitutes rather than just talking about them at a theoretical level.

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