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**PSYCHOCULTURAL ADAPTATION AND THE FORMATION
OF FISHERMEN'S COOPERATIVES IN ECUADOR**

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by

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In most fisheries departments and development agencies around the world mariculture and marine capture fisheries are often lumped together in "the fishery sector," and the producers associated with the two activities are treated as if they are somehow the same despite the fact that aspects of the work involved are vastly different. In fact, there is little similarity of work organization between the two groups of producers except that they both produce fish, shellfish, or some other marine product. The capture fishermen harvest their prey from the wild, while the mariculturists grow their "crop" as does a farmer. The capture fishermen must look for the prey and are faced with a great deal of day to day variability, in contrast to the mariculturist who grows the product, and if all goes well, is assured of a harvest, all at one time, just like a farmer. Mariculturists, like farmers, own or have individual rights to their areas of the shore or ponds. In contrast, marine fishermen for the most part exploit a common property (sometimes associated with a village, a specific region, or a nation state, etc.). Nevertheless, access provides rights--the first boat on the fish has rights to them.

The sociocultural systems that evolve around these two different modes of "fishing" are themselves quite different. Given the configuration of mariculture production, it may make more sense to include them in ministries of agriculture and animal husbandry and to treat them as different in kind from capture fishermen. Nevertheless, when it comes to developing cooperatives the two types of producers are also erroneously treated as equal, with similar techniques used to organize them into "fishermen's cooperatives." It is our contention that very different techniques need to be applied to the two types of producers. It is particularly important that we increase the precision of our understandings of the differences and similarities of capture and mariculture fisheries due to the fact that the policies that have been used in fisheries development and management are for the most part unproductive with respect to development of successful cooperatives. This point is particularly relevant at this time in history because of the growing reliance on cooperatives in the development, management, and transformation of fisheries all over the world.

Fishermen's cooperatives have long been viewed as a useful means of organizing both capture and mariculture fishermen for self-improvement and increasing the efficiency of their interactions with development projects, as well as providing them with the means to take greater charge of their own destiny (cf. Jentoft 1986; Pollnac 1985; Meynell 1984). As a consequence, they figure prominently in many national and international development projects. Nevertheless, their failure rate is unacceptably high (cf. Pollnac 1985); thus, they represent an important, almost ideal situation in which to test our theory. It is clear that some of the problems faced in organizing and maintaining fishermen's cooperatives can be attributed to aspects of the occupation which, in turn, impact aspects of fishermen's social, cultural, and psychological characteristics that can have negative consequences with respect to the organizations (cf. Pollnac 1980a, 1985; Poggie 1980a).

One aspect of capture fishermen's lives that has been emphasized in descriptive studies of fishermen is the characteristic of independence. "Need for independence" is also one of the personality characteristics of marine capture fishermen that potentially conflicts with cooperative formation. A number of researchers have indicated that fishermen can be characterized in terms of behavior and thinking that reflects a strong orientation towards independence. For example, Poggie and Gersuny (1974) emphasize the salience of "independence" in the thinking and behavior of the southern New England fishermen they studied. Further, Price (1964), Peterson and Smith (1981), and Pollnac and Ruiz-Stout (1977) note that Caribbean, U.S., and Panamanian fishermen, respectively, often cite independence as an important characteristic of the work fishermen do. According to Aronoff (1967), fishermen from Saint Kitts in the West Indies emphasize independence and self-reliance in statements concerning reasons why they chose fishing in contrast to other occupations. Kottak (1966) reports that successful marine fishing at Arembepe, Brazil requires individualistic behavior. Similar observations have been made in Southeast Asia (cf. Fraser 1960; Harrisson 1970). Finally, Pollnac (1988b) presents an analysis of a world-wide sample of 186 societies which indicates that fishing societies place greater emphasis on self-reliance training for males in late boyhood than other societal types.

The tendency toward relative independence, in the form of being able to work alone with little or no direction, on the part of marine capture fishermen has been theoretically and empirically related to environmental and technological aspects of the occupation which contrast with aspects of

mariculture activities. For example, Poggie (1980b), in the analysis of data from southern New England, has argued that this characteristic helps marine capture fishermen psychologically adapt to their occupation. The decisions they have to make in the face of uncertainty have immediate effects with respect to the safety of the vessel and its crew as well as the success of the hunt. These decisions have to be made independently, with little or no time for consultation and deliberation due to the rapidly changing nature of the sea (Pollnac 1976). Poggie (1980b) further suggests that an independent personality characteristic, the underpinning of the above behavior, is related to and selected by the environmental fact that most capture fishermen are physically removed from the help and support of land based society. In sharp contrast, mariculturists work in the relative safety of the seashore or in their ponds on the land. They know the location of their fish, and decisions do not have the same type of immediacy as those made in the rapidly changing situations at sea. There is time for consultation and deliberation. Independent-minded behavior has no selective value as among capture fishermen.

In addition to the mechanisms that promote psychological independence of individuals, there are also environmental and social reasons why capture fishing firms (independent vessels) manifest a great deal of independence in the form of relative autonomy. The difficulty of boundary maintenance in the marine environment has resulted in most fishing societies treating the open ocean as a common property resource. Even in cases where some system of sea tenure exists, it is most commonly communal in nature--the resource can be exploited only by fishermen from a specific village (cf. Ruddle and Johannes 1985; Pollnac 1985). Hence, in most fisheries the first vessel that arrives over a school of fish and deploys its gear has rights to the spot until the crew wishes to move elsewhere. Vessels are in constant competition to get to the best spots first and keep them secret if possible. This competitive spirit out on the water further mitigates against the type of cooperation needed within cooperatives ashore. In contrast, mariculturists acquire rights to their productive areas. They lease or own the productive area and make capital investments and improvements on it like a farmer. As a consequence, they are the only ones who have legal rights to remove the product. They do not have to compete with someone else to locate or get to the product first; hence, they have less need for overt competition with other producers.

Given the evidence which indicates that marine fishermen, both individually and as members of crews, are likely to be psychologically more independent and competitive than mariculturists, and that this type of thinking and behavior is adaptive due to aspects of the occupation and the marine environment, then it follows that organizing marine capture fishermen into cooperatives or other types of organizations will be different than organizing mariculturists. The success of capture fishermen's cooperatives will probably require more mechanisms of social solidarity among members to counteract their tendency towards independence and inter-crew competitiveness. This is not to say that it will be impossible to promote successful cooperatives among capture fishermen, but that organizational techniques will have to be adjusted to the different characteristics of the two types of marine producers.

THE RESEARCH

The goal of this paper is to empirically test the theory outlined in the introduction by identifying some of the sociocultural differences between capture and culture fishermen. This will be accomplished by comparing the correlates of relative success of fishery capture and culture cooperatives in Ecuador. Ecuador is an ideal setting to test this theory as it is a country where both capture and mariculture cooperatives are found in the small-scale fisheries sector. If the theory presented above is correct, there should be different correlates of success for the two types of cooperatives due to the fact that they require different modes of organization to be successful.

While the focus of this paper will be identification of differences in operating styles which influence the success and failure of capture fishermen's and mariculturists' cooperatives, it will also be necessary to examine the relationships of other, potentially confounding variables, on cooperative success. The success of fishermen's cooperatives depends on a large number of factors as indicated by the large number of variables identified in the literature for local organizations in general (Esman and Uphoff 1984) and fishermen's cooperatives in particular (Pollnac 1988a; Poggie 1980b; Meynell 1984). Pollnac (1985) in a comprehensive review of the literature identified no fewer than 21 important determinants of the success of fishermen's organizations, some of which are clearly clusters of interrelated variables.

As a first step in testing our theory concerning mariculture and capture fishermen's cooperatives, we examine differences in factors influencing the success of marine capture and shrimp culture cooperatives in coastal Ecuador. Three basic complexes of variables are examined to determine their relationship with cooperative success: 1) community context: variables which are related to the level of development of the community within which the cooperative is located; 2) material development: variables indicating the level of material development of the cooperative itself; and 3) operating style: variables indicating characteristics of organization membership, management, and operations of the cooperatives. The variables clustered under operating style are those of greatest interest in terms of testing our theory as well as the applied problem of adapting cooperative operations to capture fishermen. The other two complexes of variables are examined to determine if they have any confounding or independent effects. Legislation concerning fishermen's cooperatives, a factor related to problems in organization development (cf. Pollnac 1988a), is controlled by examining cooperative success and failure within the common legal context of a single country, Ecuador. Use of a sample drawn from a single country also reduces, although does not eliminate, variance due to cultural differences.

METHODS

Sample The sample consists of 48 fishermen's cooperatives distributed throughout four coastal provinces in Ecuador: Esmeraldas, Manabi, Guayas, and El Oro. The majority of the cooperatives (69%) are composed of fishermen who devote most of their effort to capturing fin fish used for human consumption ("white fish"). Twenty-three percent of the cooperatives are primarily involved in shrimp culture (growing shrimp in ponds); four percent in capturing shrimp; and one cooperative each is primarily involved in tuna fishing and capturing post-larval shrimp. Post-larval shrimp are sold and used for stocking shrimp ponds.

Measures As a measure of cooperative success, seven items presumed to be indicators of success were factor analyzed using orthogonal rotation (varimax). The scree test (Cattell 1966) was used to determine the cut-off point for number of factors to be rotated. The analysis resulted in one factor (see Table 1). Only one item, increasing membership, did not fit into the scale as indicated by its negative factor loading. The rest of the items form a logically cohesive scale of cooperative success.

Community context was measured using a check list of 17 items which can be seen in Table 2. These items were factor analyzed using the technique described above. The analysis resulted in two factors (see Table 2). Factor One

Table 1. Factor analysis of cooperative success items.

<u>VARIABLE</u>	<u>FACTOR 1</u>
Membership development trend	-.30
Property development trend	.42
General development trend	.62
Members comply with co-op rules	.76
Level of development	.79
How well is co-op working	.83
<u>Satisfaction of members</u>	<u>.81</u>
Percent variance	45

Table 2. Factor analysis of community context items.

<u>VARIABLE</u>	<u>FACTOR 1</u>	<u>FACTOR 2</u>
Public transportation	.88	.24
Bar	.86	.23
General store	.79	.11
Electricity	.78	.16
Primary school	.75	.07
Church	.71	.33
Road	.67	.14
Public water supply	.50	.34
Postal service	.04	.83
Drugstore	.23	.82
Food market	.18	.80
Secondary school	.25	.76
Telephone service	.14	.74
Telegraph service	.05	.71
Rural dentist	.36	.62
Medical center	.38	.57
<u>Rural doctor</u>	<u>.40</u>	<u>.48</u>
Percent variance	30	29

includes basic items; e.g., primary school, public transportation, improved road, water supply, etc. Factor Two includes more advanced or higher level services such as secondary school, doctor, dentist, telephone, etc. Factor One is identified as a Basic Development Factor and Factor Two as an Advanced Development Factor.

Cooperative material development was measured using another checklist of 17 items which can be seen in Table 3.

Table 3. Factor analysis of cooperative material items.

<u>VARIABLE</u>	<u>FACTOR 1</u>	<u>FACTOR 2</u>
Boats	.83	-.32
Motors	.81	-.25
Nets	.77	-.15
Office Equipment	.59	.47
Drydock	.58	.11
Vehicle	.40	.27
Radio	.37	-.07
Motor repair facility	.33	.06
Furniture	.35	.44
Scales	.35	.48
Water	.07	.63
Toilet	-.19	.63
Lights	-.21	.61
Television	-.03	.60
Fish storage	-.04	.59
Dock	-.07	.45
Land	.09	.39
Percent variance	20	18

The same factor analytic procedure used in the analysis of community context items was carried out and also resulted in two factors. In this case, the first factor includes productive items (e.g., boats, motors, nets, and a vehicle) as well as repair facilities for them (drydock and motor repair facilities). The second factor includes larger, more permanent improvements of facilities such as a dock, fish storage facilities, and land. It also includes elaborations such as a toilet, lights, running water, and television. Items such as office equipment, furniture, scales, and to a certain extent, a vehicle, are shared by both factors. The first factor will be referred to as a Productive Equipment Factor and the second as a Cooperative Facilities Factor.

Cooperative membership and management characteristics were measured using a check list of 18 items which were factor analyzed, again using the same technique as in the preceding three analyses. As previously, the scree test indicated a factor cut-off at two factors. The items and their distribution across the factors are presented in Table 4. The first factor derived is identified as a management

Table 4. Factor analysis of cooperative operating style characteristics.

<u>VARIABLE</u>	<u>FACTOR 1</u>	<u>FACTOR 2</u>
Receive development loan	.85	.13
Past loan paid-off	.84	.13
Administrators paid salary	.77	.01
Members follow orders	.77	-.29
Members sell only to cooperative	.62	.27
College educated administrator	.44	.32
Receive continuous government aid	.34	-.04
Full-time fish seller	.48	.24
Received government assistance	.21	.25
Members carry-out obligations	.15	.79
All members participate in meetings	.07	.73
Cooperative sponsors social events	.15	.72
Good relations among members	-.06	.70
Administrator with coop experience	-.08	.40
Cooperative sponsored savings plan	-.47	.39
At least 50% own their own boat	-.32	.36
Members trained to work together	.04	.36
<u>Building owned by cooperative</u>	<u>.13</u>	<u>.36</u>
Percent variance	22	18

style factor. Items such as loans, education of administrators, government assistance, and members selling to the organization load highly. The second factor includes items related to social solidarity such as members carrying out obligations, attending meetings, social events, and other positive relationships among members. Even the presence of a savings plan on this second factor points towards a fair amount of trust in each other and the organization; hence, related to social solidarity. Both factors are clearly related to style of cooperative functioning. The first will be referred to as the Management Style Factor, and the second as the Social Solidarity Style Factor.

Standardized factor scores were calculated for each of the above seven factors for all cooperatives in the sample. These factor scores are the measures of the variables used in the analysis.

ANALYSIS

As a first step in the analysis the distribution of factor scores for cooperative success (the dependent variable) across the four regions is examined. Ecuador's fishing populations manifest a wide range of environmental and cultural diversity; hence, it is important to determine if variation in cooperative success is related to region. To test for regional variation, factor scores for the success measure are examined across the four geographical provinces in the sample. The results of this analysis are found in Table 5. This analysis indicates that the differences in levels of cooperative success are not significantly related to region.

Table 5. Regional distribution of mean factor scores for the success factor.

<u>PROVINCE</u>	<u>MEAN SUCCESS FACTOR SCORE</u>
Esmeraldes	.18
Manabi	-.36
Guayas	.01
El Oro	.41
F-ratio	1.36
d.f.	3 40
p	0.27

The sample was divided into two groups, culture versus capture cooperatives, to determine if predictors of success differ according to type of organization. The theory developed in the introduction leads one to predict that the highly developed competitiveness and need for independence among capture fishermen will require organizational techniques that differ from those used successfully among fish farmers and other occupational groups. The correlations between the predictor variables and levels of

success for the two different types of cooperative are presented in Table 6.

Table 6. Correlations between success and the independent variables.

<u>VARIABLE</u>	<u>COOPERATIVE TYPE</u>	
	<u>CULTURE</u>	<u>CAPTURE</u>
Basic development	-.07	-.10
Advanced development	.60	-.13
Productive equipment	.67*	.32
Facilities	.57	.36*
Management	.90**	.30
<u>Social solidarity</u>	<u>.84**</u>	<u>.73**</u>
N	9	33

* = $p < .05$ ** = $p < .01$

Table 6 indicates that the Productive Equipment, Management, and Social Solidarity Factors are related to cooperative success among shrimp culture cooperatives, and only the Social Solidarity and Facilities Factors are significantly correlated with the success of capture fishermen's cooperatives.

It is clear that interrelationships between the independent variables can influence the zero-order correlations presented in Table 6; hence, regression techniques were applied to determine the best combination and relative importance of the predictor variables. Two different regression techniques were used to select the best predictor variables: stepwise and all combinations of variables. With the stepwise technique, all independent variables are entered in a stepwise manner. The first variable entered is the one with the highest correlation with the dependent variable. The entered variable is controlled, and partial correlations are calculated for the remaining independent variables. The one with the highest partial correlation is entered next, and the procedure is continued until all independent variables are entered into the regression equation or some previously set cut-off criterion is reached. In the analysis presented here, the F-ratio associated with the partial had to equal or exceed 4.0 for the variable to be entered.

The other type of regression analysis used calculates a regression equation for all possible subsets of the independent variables (e.g., every possible combination of two, three, etc.) and selects the "best" subset on the basis of a set criterion. Here the criterion used was Mallows' C which is based on a ratio of the residual sum of squares for the selected subset to the residual mean square using all independent variables with a correction for number of variables in relation to sample size (Daniel and Wood 1971).

Both regression techniques selected the same subsets of variables as the best predictors of cooperative success. For both the capture and culture cooperatives, the two operating style factors are the principal predictors of success. In the case of the shrimp culture cooperatives, the Productive Equipment Factor, which had a significant zero-order correlation with success, manifested a partial correlation of only 0.28 ($F = 0.4$) with success after the Management Style and Solidarity Style Factors were entered into the regression equation; hence, it was not included in the set of best predictors. With respect to the capture fishermen's cooperatives, the partial correlation between the Management Style Factor and success with Social Solidarity Style controlled increased to 0.38 ($F = 4.91$), and the partial with the Facilities Factor reduced to 0.02 ($F = 0.02$). This was probably due to the modest correlation between the Facilities and Social Solidarity Factors among the capture fishermen ($r = 0.47$). Therefore, the Facilities Factor was eliminated while the Social Solidarity Factor was used in the equation. Overall, the results of the analysis are quite impressive--the cooperative operating style variables account for 94 and 58 percent of the variance in success of the shrimp culture and capture fishermen's cooperatives, respectively. The results of this analysis can be found in Table 7.

Table 7. Results of stepwise and best subset regression analyses predicting cooperative success.

<u>VARIABLE</u>	<u>STANDARDIZED BETA COEFFICIENTS</u>		<u>CONTRIBUTION TO R²</u>	
	<u>CULTURE</u>	<u>CAPTURE</u>	<u>CULTURE</u>	<u>CAPTURE</u>
Social solidarity	.49**	.72**	.15	.52
Management	.61**	.26*	.24	.07
Adjusted R ²	<hr/>			
	.94***	.58***		

* = $p < .05$

** = $p < .005$

*** = $p < .001$

The standardized regression coefficients in Table 7 indicate that while both cooperative operating style variables contribute to success of both types of cooperatives, social solidarity is most important among the capture fishermen in contrast to managerial style among shrimp farmers. Contribution of these two variables to the amount of variance explained (R^2) in success also leads to the same interpretation. In Table 7, contribution to variance is the amount by which the R^2 would be reduced if the variable were removed from the multiple regression. The contribution to variance clearly indicates the extreme significance of social solidarity to the success of capture fishermen's cooperatives.

DISCUSSION

The analysis of the data clearly supports our theory by uncovering a significant difference in the importance of social solidarity and managerial effectiveness for the two types of fisheries cooperatives studied in Ecuador. While managerial items contribute most to the success of shrimp culture cooperatives, items associated with social solidarity clearly have a greater importance for the success of capture fishermen cooperatives. Managerial effectiveness contributes only a small amount to the success of the capture cooperatives.

These findings are also in accord with the practical considerations presented in the introduction to this paper. In adapting to the requirements of fishing in the marine environment, capture fishermen need to be independent both individually and in terms of competitive crews. The only way that they can be organized into a cooperating, interdependent group is through actions aimed at increasing the social solidarity of the cooperative members. It is a mistake to categorize mariculturists and capture fishermen as "fishermen" and therefore treat them the same in terms of developmental policy. The two types of producers have completely different work organizations which influence their behavior and ways of thinking. The analysis makes it clear that these different factors powerfully influence the success of the two types of cooperatives. The differences are understandable according to our theory as related to the relative independence and competitiveness of capture fishermen, in comparison to mariculturists. Governments, aid organizations, entrepreneurs, fishermen, and others involved in marine resource development and management using fishermen's organizations would all benefit from the appropriate formulation of policies which best fit the empirically demonstrated needs of the humans associated with the two different modes of production. Policies of this

sort would help reverse the dismal performance of fishermen's cooperatives in Ecuador and around the world by strengthening, rather than ignoring, the psychocultural fabric of their members.

NOTES

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2. Sample size varies slightly in the analyses due to missing data for some variables.

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