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**Sociocultural Aspects of Technological
And Institutional Change among
Small-Scale Fishermen**

by

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INTRODUCTION Although much has been written concerning psychological, social, and cultural responses to techno-economic change in agrarian and industrial sectors of society, little systematic effort of comparable magnitude has been directed at small-scale fisheries. This is probably due to the fact that in comparison with agriculture and industry, small-scale fisheries have extremely small impacts on most national economies. Nevertheless, when viewed on a worldwide basis, the number of individuals involved in small-scale fisheries is quite impressive. The United Nations Food and Agricultural Organization has recently estimated that there are 9.2 million small-scale fishermen in developing countries (F.A.O. 1974). This figure does not include the approximately 4 million employed in associated activities such as fish processing, selling, equipment manufacture, etc.

As producers of high quality protein in a world suffering from food shortages, the importance of this occupational subculture should not be underestimated. Ongoing and future attempts to improve the technology and production of small-scale fishermen will meet and hopefully overcome many of the same social, cultural, and psychological dislocations that occurred and are occurring as a result of change in the agrarian and industrial sectors of society. The purpose of this paper is to briefly examine the interrelationship between technological and institutional change and several important aspects of man's social adaptation to the occupation of small-scale fishing. The relationships between certain social and techno-economic aspects of small-scale fisheries will be examined

and a model of these relationships will be developed. Examples of how technological and institutional changes impact on social relationships will be provided from actual small-scale fishery development programs, and suggestions will be provided concerning the utility of the model for development programs.

SOCIAL ADAPTATION TO TECHNO-ECONOMIC ASPECTS OF SMALL-SCALE FISHERIES Several

aspects of small-scale fishery technology result in social relationships that differ somewhat from those found in agrarian social groups (cf. Pollnac 1976). This section of the paper examines the relationship between small-scale fishing technology and aspects of workgroup and non-workgroup structure, the ownership of productive equipment, and degree of social stratification.

Turning first to workgroups we find that fishing technology is related to workgroup composition and structure. In a comparison of Thai fishermen and farmers, Foster (1975) notes that in contrast to farming groups the size of fishing groups is rigidly determined by technology. This is obviously related to the limited space on a vessel. Further, Norr and Norr (1974) note that ocean fishing demands much more reliance on reciprocal interdependence and coordination of crewmen than agriculture. Pulling a net, lurching a boat through a heavy surf, and responding to the ever changing nature of the sea requires a high degree of skillful coordination among a compatible workgroup. Thus, technological constraints limit the size of the workgroup and environmental and technological constraints select for worker efficiency. It appears, therefore, that crew composition should be flexible and not based on prescribed social criteria. Nevertheless, we find that social groups play an important role in workgroup composition among small-scale fishermen.

Kinship plays an important and varied role in the structure of the occupation of fishing in many parts of the world. The importance of kinship in fisher-

men's workgroups has been extensively cited in the literature from regions as widely separated as Ghana (Quinn 1971), Peru (Sabella 1974), Micronesia (Knudson 1970), Canada (Breton 1973), the Faroe Islands (Blehr 1963), Ulithi (Lessa 1966), Panama (Pollnac 1977a), and the West Indies (Aronoff 1967). The need for harmony on a vessel is essential for success at sea, and kinship ties may enhance cooperativeness within the workgroup. Other factors may also increase the tendency toward kin based crews. For example, Gladwin (1970) notes that among the Mfante of Ghana, boat crews with family cores are more stable than non-kin linked crews. On Malakal kinship ties are related to the sharing and loaning of capital equipment such as boats (Sahlins 1962), while on Tikopia canoes are nominally owned by heads of kin groups, but actually by the kin group as a whole (Firth 1955). Sabella (1974) suggests that the use of kin in the crew among small scale fishermen from Peru is often related to keeping boat production within the family. Finally, Bartlett (1977) notes that having Kinsmen as crewmembers in Gloucester, Massachusetts makes economic sense - Kinsmen are less likely to sue; Thus reducing the need for expensive liability insurance.

Among some fishing people, however, we find that kinship plays little or no role in crew composition. Glacken (1955) notes that family members fish from different vessels on Okinawa. This is done to minimize loss to individual families if a fatal accident occurs.

McGoodwin (1976) also reports that kinship does not play a significant role in crew structure among shark fishermen in Northwest Mexico. He suggests that this situation results from the fact that closely related kin are not likely to take orders without complaint, and that they would probably resent their retention through debt peonage, a common technique used to keep crew members among these fishermen. Further, neither Taiwanese (Diamond 1969) nor Malay (Firth

1966) fishing crews are primarily based on kin ties. Norr (1972) reports a similar situation in South India and suggests that the skilled nature of the occupation of fishing results in worker recruitment on the basis of skill and interpersonal ability rather than social ties.

It is important to note, however, that some researchers have found that the role of kinship in crew structure varies consistently within a single society. For example, Pollnac and Ruiz-Stout (1977a) report variability in the role of kinship in crew structure among Panamanian small-scale fishermen. They indicate that overall only 39 percent of the fishermen interviewed fish with family members. This figure, however, obscures the fact that in the rural areas of their sample over one-half (52 percent) of the fishermen fish with kin in contrast to only 12 percent in the urban areas. This difference is statistically significant ($\chi^2 = 23.08, p < .001$). More recent research in the Gulf of Nicoya on the Pacific Coast of Costa Rica suggests a similar pattern. 75 small-scale fishermen were interviewed in Puntarenas, the major Pacific port of Costa Rica, and 50 were interviewed at Costa de Pajaros, a concentration of fishermen in a rural region on the Gulf of Nicoya. For the total sample we find that a slight majority (52%) of the fishermen do not fish with kin. 34 percent of the fishermen fish with at least one relative, 10 percent with two, while only 4 percent fish with three or more kinsmen.

As can be seen in Table 1, however, the rural and urban areas differ significantly with regard to the role that kinship plays in crew membership.

Table 1. Number of Relatives in Crew

<u>Number</u>	<u>Urban</u>	<u>Rural</u>
4	1	3
3	0	1
2	6	7
1	20	22
0	48	17
Total	75	50

66 percent of the rural as contrasted with 36 percent of the urban fishermen fish with relatives. This difference is statistically significant ($\chi^2 = 10.817$, $p < .01$).

Table 2 indicates kin types that fish with respondents in both the rural and urban area. Tabular entries refer to number of respondents reporting designated relative as a crew member.

Table 2. Relationships Between Respondents and Crewmembers.

<u>Relationship</u>	<u>FREQUENCY</u>	
	<u>Urban</u>	<u>Rural</u>
Father	6	5
Brother	6	19
Son	5	4
Father's Brother	2	3
Mother's Brother	0	1
Nephew	2	1
Spouse	2	0
Cousin	2	5
Wife's Brother	2	2
Non-relative	48	17

The rural column in Table 2 sums to more than 50 because some rural fishermen fish with more than one kin type. Overall, the greatest difference between the rural and urban area with respect to crew membership is the higher proportion of brothers who fish together in the rural area. In the rural area we find that 38 percent of the fishermen fish with a sibling in contrast to only 8 percent in the urban area ($\chi^2 = 16.875$, $p < .001$).

There is thus a great deal of variability in the role that social groups play in small-scale fishermen's workgroups. It has been indicated, however, that in many societies, kinship plays an important role in boat crew composition.

Turning to the structure of relationships within small-scale fishermen's workgroups, Norr and Norr (1974) have suggested that the need for coordination within fishing crews and the physical risks associated with the marine environment increase both the need for interdependence and the importance of each worker. This, in combination with the rapid depreciation of equipment and the possibility of equipment loss, decreases the social and economic distance between owners and laborers. Hence, they argue that work relationships in fishing crews should be more egalitarian than among farmers. Their data and the ethnographic literature supports this proposition. For example, Norr (1972) reports that few distinctions are made within workgroups among fishermen of South India; that the owner does not direct work--he participates as an equal. Burrows and Spiro (1953) comment on the egalitarian nature of fishing workgroups in Ifaluk, and contrast this with the general rank consciousness of Ifaluk society. On Taiwan, Diamond (1969) notes that friendship characterizes the relationships between crew members. T. Gladwin (1970) reports that although the navigator is in command of the vessel on Puluwat, he is not aloof-- he pays attention to the suggestions of crew members and imparts a sense of egalitarianism. At, Arembepe, Brazil, Kottak (1966) writes that the captain works like all the other crew members. When the fishing begins he is the same as the crew. Knudson (1970) stresses the fact that the exploitation of terrestrial resources is an individual act in Micronesia while marine resources are exploited by cooperative groups. The same general relationship holds in Nicaragua among Miskito turtle fishermen. There, land hunting partnerships are loose in contrast to the close cooperation demanded between turtle fishermen. Turtle men must have partners they can rely on; thus, partnerships form around each individual's skill, reliability, and temperament (Nietschmann 1973). The need for cooperation in trap fishing among the Matupit of New Britain is given structural expression in groups known as

motoni which are associated with particular areas of beach used for fishing related activities (Epstein 1969). On Saint Kitts in the Caribbean, Aronoff (1967) notes that fishing crews are integrated and cooperative with little stratification in comparison to cane cutter groups. He notes that fishermen are likely to view their captain as helpful and nurturant in contrast to cane cutters who view the head cutter in a negative manner, suggesting that he takes advantage of the men. Firth (1966) reports that among Malay fishermen the crew leader shows a readiness to consult the crew on matters of policy. Mfantese fishermen of Ghana believe that harmony in the boat is essential to safety at sea (Quinn 1971). Sabella (1974) writes that cooperation is so necessary among the fishermen of Caleta San Pablo, Peru that arguments stop short of the beach. He further notes that crews are very egalitarian--even the captain performs the same work as the crew. Brandt (1971) comments on the egalitarian nature of interaction aboard fishing vessels in Korea, and finally, Faris (1977) suggests that overall there is an ethos of egalitarianism among peasant fishermen.

The egalitarian nature of artisanal fishermen workgroups was commented on in detail because of the important role that workgroup organization plays as an element of social organization. Workgroup organization is so important that when fishing people form part of a society that has a strong system of social stratification, ocean fishing is sometimes organized as the occupation of a low status, caste-like group (e.g. as in Japan and India). Norr and Norr (1974) suggest that this caste-like separation of fishermen functions to insulate the larger society from these potentially threatening egalitarian relationships.

Additionally, workgroup organization is often related to shore-side social organization. In many societies crew leaders (e.g. navigators in Polynesia, captains, etc.) also enjoy a leadership role ashore (cf. Davenport 1956;

T. Gladwin 1970). Further, the friendships which often develop between crew members sometimes form the basis for non-fishing groups. Fraser (1960) reports that among Malay fishermen of South Thailand, boat groups are very durable and frequently serve as the foundation for other social and economic groups.

Turning next to the relationship between small-scale fishing technology, the ownership of productive equipment, and social stratification we find that several scholars have made important observations concerning differences between ownership of the means of production in farming and fishing communities. Firth (1966) notes that land ownership has a permanency not associated with fishing equipment. The constant motion and fluidity of the marine environment in combination with sudden, violent storms at sea make fishing equipment especially liable to sudden damage and loss. Norr and Norr (1974) argue that the rapid depreciation of fishing equipment in combination with occasional losses result in higher rates of occupational mobility in fishing than in farming. They suggest that this results in smaller social and economic distance between owners and laborers in fishing.

Kottak (1966) provides a good discussion of how the relatively simple technology of the small-scale fishermen of Arembepé, Brazil provides relatively equal opportunities for all fishermen to own capital equipment thus resulting in a relatively egalitarian community. He notes that the cost of the technology is approximately equal to the average annual earnings of fishermen in the community; thus the opportunity to buy a boat is theoretically open to all fishermen. He points out, however, that other mechanisms operate to prevent the development of social stratification resulting from income variance between successful and non-successful fishermen. These mechanisms include reciprocal exchange networks as well as annual festivals which demand more resources from the more wealthy;

thus, leveling out the distribution of wealth. He also notes that the relatively short lifespan of plank boats inhibits transgeneration transfer of ownership differentials through inheritance.

Although the ownership pattern that Kottak (1966) described for Arembepe is quite common among small-scale fishermen, the literature indicates a wide range of possibilities. Ownership patterns include both individual fisherman owners (e.g. Firth 1966; Kottak 1966) and non-fisherman owners (e.g. Forman 1970). In some cases several members of a crew will cooperatively own a large boat (cf. Fraser 1960). In other cases large, sea-going canoes are owned by kinship lineage heads (cf. Firth 1965) or lineage members in common (cf. Lessa 1966). In general, the larger and more complex the technology, the more likely it will be owned by non-fishing entrepreneurs (e.g. middlemen, local elites, etc. cf. Forman 1970) or groups of individuals (e.g. kin groups; cf. Nason 1975). Further, as the price of technology increases there is a greater likelihood that individuals will emerge who will function as financiers (cf. Sabri 1977; Emmerson 1975; Firth 1966). It is often the middleman (discussed below) who fulfills this function. When the ownership pattern of relatively complex, expensive equipment is individual entrepreneurship rather than cooperative kinship or workgroups, there is great potential for increasing social stratification and inequality. This has led many development organizations to suggest that the best means of introducing complex, expensive equipment is through cooperative organizations.

Another important aspect of small-scale fishing is that as technology becomes more efficient, enabling production in excess of the subsistence level, a need for a distribution system develops. Fish is a highly perishable product which is not easily stored without complex techniques such as drying or freezing technologies. Firth (1966) notes that a fisherman's catch, in comparison

with a farmer's product, needs more outlay in equipment and labor if it is to be stored. This, he suggests, results in a tendency for a greater development of middlemen among fishermen. Further, a fisherman's many hours at sea is physically exhausting, and when he arrives at shore he usually does not have the time or energy to process or distribute his highly perishable product; thus, the distribution of surplus catch is usually performed by a specialist who is often referred to in the literature as a middleman or fish dealer.

In many fishing communities, females take over the function of buying and selling fish. Female "middlemen" are found throughout the world in regions as widely spread as the Caribbean (Aronoff 1967), El Salvador, Brazil (Forman 1970), Ghana (Gladwin 1970), India (Norr 1972), Thailand (Fraser 1966), and Okinawa (Glacken 1955). Sometimes this division of labor functions to keep at least some of the profits within the family--the men fish, and their female relatives sell the product (cf. Forman 1970; Gladwin 1970).

Nevertheless, the middleman is not always a kinsman. In many regions the middleman is an unrelated entrepreneur whose sole motive is to make a profit by buying and selling fish. Further, it is often claimed that middlemen exploit the small-scale fisherman (cf. Jimenez-Castro 1976; Alexander 1977; Witham, et al 1978). Often, however, even in regions where outsiders and the government view the middleman as exploiting the fisherman, the middleman is doing an excellent job at performing a vital function and making very little profit. For example, Firth (1966) noting that it is a common accusation that middlemen reap the benefits of the fishery, reports that among the Malay in his sample, the middlemen make very little profit for the time and energy they expend. Our preliminary observations in Costa Rica have led to the same conclusion. Further, the fishermen themselves often recognize the multifunctional nature of the middleman and are content with the existing system despite their continuous

complaints about prices (a common complaint of primary producers around the world). For example, in Malaysia the small-scale fishermen reportedly appreciate the role that the middleman plays as a financier for capital equipment (Sabri 1977). Blake (1977) notes that among Madras fishing populations in India, the middleman functions as both business contacts for fishermen and dependable sources of cash when production drops off and when large expenditures are necessary (e.g. for weddings, funerals, and holidays).

In an attempt to gain a more complete understanding of the middleman in Costa Rica we interviewed 80 small-scale fishermen in the Gulf of Nicoya. 50 of these fishermen were from an urban area (Puntarenas) and 30 from a rural community (Costa de Pajaros). The middleman, or fish buyer, is an important individual in the structure of the small-scale fishing industry in the Gulf of Nicoya. On the short strip of coastline where interviews were conducted in Puntarenas there were seven active middlemen. At Costa de Pajaros five were active. Other middlemen existed in both areas, but they were either outside the area sampled or not active during the research period. Ostensively, the middleman performs the important function of purchasing fish from the fisherman for resale to other middlemen or retailers. He does, however, provide other services for the fishermen. The number of active middlemen in the region and statements made by fishermen suggests that competition exists between the various buyers; hence, fishermen were asked why they sell to one middleman rather than another. The percent distribution of the first three responses to this open-ended question can be found in Table 3.

The most frequent rationale for selecting one buyer over another is the prices paid for fish. The second most frequent rationale is that a fisherman would rather deal with a buyer who helps him in some way, such as providing loans, picking up parts, etc. Fishermen also select buyers on the

Table 3. Distribution of Rationales for Selection of Middlemen

<u>RATIONALE</u>	<u>PERCENT*</u>
Better prices	48
Provides help (loans, etc.)	45
Fair treatment	31
In debt to middleman	9
Friendship	8
Always buys fish	6
Closer to residence	4
Other	10

N=80 *Total exceeds 100% because entries reflect categorization of the first three responses to an open-ended question.

basis of what they perceive as fair treatment. This category includes the attributes of honesty, immediate payment for product, not discarding marginally spoiled fish, etc. Nine percent of the fishermen report that they sell to a specific buyer because they are in debt to him, while eight percent claim they make their decision on the basis of friendship. A small proportion of the fishermen choose middlemen who never refuse their product. Some middlemen refuse to buy when the market is glutted, and the fishermen are forced to let their product rot. Several fishermen noted that they deal with a specific buyer because he is located closer to their home. The "other" category includes idiosyncratic responses such as "character of buyer," "landing facilities," and "more responsible."

The first, and therefore most salient, high frequency responses were cross-tabulated with area of residence. The expectation that urban fishermen would be more likely than rural to select buyers on the basis of price was supported by the data (44 versus 23 percent respectively: $\chi^2=3.47$, $p < .05$; one-tailed test).

in the cash economy; thus, we would expect that prices paid by middlemen would be their most salient attribute in the urban area. In contrast, the rural fishermen are more interested in the help that the middleman provides in the form of loans, picking up parts for equipment, etc. (37 versus 14 percent respectively; $\chi^2=5.52$, $p<.02$). Finally, there is no relationship between area of residence and the "fair treatment" category ($\chi^2=0.02$, $p>.10$). Overall, these findings in combination with our brief review of the literature above suggest that there is a complex relationship between middlemen and social and technological aspects of the small-scale fishery. The assumption of middleman as exploiter, however, has led to many attempts to replace him before fully understanding the multidimensionality of his role in the fishing community.

Figure 1 sums up the discussion of the relationship between small-scale fishing technology and aspects of workgroup and non-workgroup composition and structure, aspects of the ownership of productive equipment, degree of social stratification, and distribution systems. First, it was noted that vessel size and complexity affect both crew size and recruitment of crew on the basis of skill. It should be noted here, however, that more efficient equipment which reduces necessary crew size may result in unemployment and increased social stratification. We have also found that crews are often selected on the basis of social criteria such as kin group membership. Small-scale fishermen workgroups, however, tend to be egalitarian in structure due to the fact that many shipboard tasks require close cooperation between fishermen. These close interdependent ties between crewmembers often result in the formation of male groups ashore based on the maritime workgroup. Further, it was noted that the generally low cost of small-scale fishing technology, the impermanent nature of the equipment, and the close cooperation required usually result in little social distinction between owner and laborer within small-scale fishing groups. Nev-

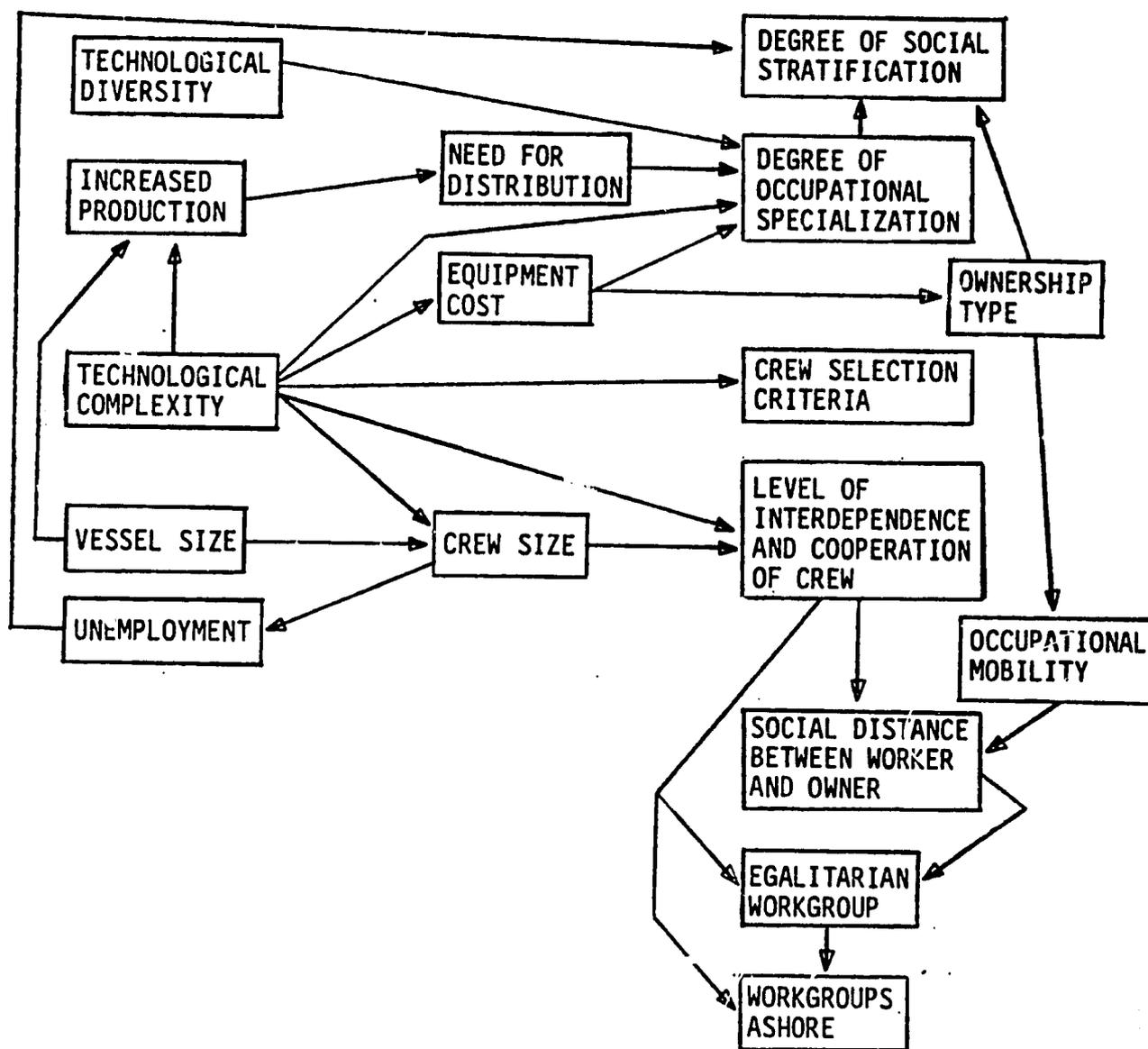


Figure 1. Relationship between technology and social organization.

ertheless, as equipment costs increase due to increased size or complexity, the likelihood of individual fisherman ownership decreases; thus promoting the development of social stratification and inequality. Additionally, increased costs of capital equipment often lead to the development of financing specialists. Finally, we have seen that as surplus production increases, there is an increasing need for distribution and processing specialists. The multidimensional nature of the role of these specialists in the social structure of the small-scale fishing community was briefly discussed. The structure of these various interrelationships between small scale fishing technology and social organization can be found in Figure 1.

SOCIOCULTURAL ASPECTS OF TECHNOLOGICAL AND INSTITUTIONAL CHANGE In this section of the paper examples will be provided which will demonstrate the interrelationships between technological and institutional changes and aspects of social organization contained within the model developed in the previous section. A study conducted by Fraser (1966) among Malay fishermen of South Thailand provides a good example of the impact technological change can have on workgroups and other aspects of a sociocultural system.

Traditionally, the Malay fishermen of Rusembilan relied on oars and sail to take them to their fishing grounds. In 1956 groups of boat owners and steersmen (traditionally a high status position in the boat crew) dominated deliberations concerning the best way to motorize the fleet. They decided to introduce tow boats to take fishing vessels to fishing areas and bring them back. Groups of boats would form tow-groups associated with a particular tow boat. This new technology immediately placed considerable strain on the traditional social system.

steerers lost their previous independence with regard to locating fish and timing return to market. Second, after a period of poor fishing, wives of members of the more skillful boat crews realized that they were subsidizing less successful crews since shares were based on the tow-group's total catch. Fraser (1966) notes that this situation had broad repercussions in other areas of community life. It resulted in overt hostility between women, and relations between men became strained. The coffee shops, which were the focus for community decision making groups and associated with boat crews, manifested a marked drop in attendance, reflecting the social strains. Attendance at coffee shops never fully recovered. Further, traditional village authority figures, the orang baik (morally good man), were involved in ownership of tows and their operation, thus, the chief source of authority and means of maintaining village control were undermined. Finally, because the religious leaders of the village remained aloof from the changes, their status increased.

Before long, the strains became too great, and the tow boats were eliminated. The reindividualization of fishing did much to restore good relations, but the degree of community organization which was originally based on boat crew membership and the traditional authority of the orang baik (whose traditional status depended on boat group affiliation) was never regained. Further, the introduction of nylon nets and individual motorized vessels reduced the need for a large crew; nevertheless, the crews were kept larger than necessary in keeping with traditional crew structure. Fraser (1966) argues that this featherbedding plus decreasing catches undermined the sense of pride that traditionally characterized crews. This reduction of group solidarity negatively affected the relatively high status of the steerer and, hence, his status in the community at large.

Thus a change in technology that was ill adapted to the traditional social structure of work was rejected, and the negative changes that occurred in the traditional social structure were never totally corrected. Further, traditional social organization dictated a crew size that resulted in inefficient application of other technological innovations. A similar reluctance to change work-group structure was recently reported for small-scale fishermen in Malaysia. Sabri (1977) notes that although winches were installed; thus reducing the number of fishermen needed on a vessel, traditional crew size was maintained to provide employment for members of the extended family. In another area of Malaysia, however, Yap (1977) reports that improved technology resulted in crew reduction and significant unemployment among fishermen with no alternative occupations. This impoverished class of unemployed fishermen, of course, increased the degree of social stratification within the fishing community as our model indicates.

The model also indicates that there is a relationship between technological change, equipment cost, equipment ownership patterns, and social stratification. Epple (1977) provides a good example of how mechanization, because of increased price of capital equipment, altered patterns of fishing boat ownership on Grenada. Prior to mechanization, 90 percent of the fishermen owned their own boats. Following mechanization this figure dropped to 25 percent. Sabella (1974) also noted that as Peruvian small-scale fishermen began to depend on expensive, highly specialized equipment, their formally egalitarian community began to manifest signs of social stratification. Finally, among Malay fishermen, increased costs of productive equipment associated with modernization has resulted in a class of equipment owners. Firth (1966) has noted that although equipment modernization has resulted in greater overall returns, increasing capital costs have led to a marked drop in the percentage of

earnings going to the labor force. Despite the fact that the fisherman has become, in effect, an employed laborer in the new system, he is treated as a participant in a common enterprise and thus not put on a regular wage basis. His income is still based on a share of the catch. Firth (1966) notes that among the Malay fishermen, costs are removed from the catch before shares are calculated; thus, given the periodic nature of production in the marine environment, fishermen often receive next to nothing. He therefore reports that in 1963, the fishermen were in a less advantageous position than when he first studied them in 1939-1940, and that the entrepreneurs were much more economically powerful than their predecessors of a generation earlier.

Even when governments are aware of new technologies' potential effect on social stratification because of initial costs, problems occur and increased disparity in wealth result. For example, Alexander (1975) reports that in Sri Lanka the government was aware of financing problems associated with costly new fishing technology, so they introduced a hire, purchase scheme. Individuals who took part were selected by ballot from qualified applicants. The individual fisherman had to provide a deposit and received a government loan, repayable over five years, to purchase a hull boat with an engine. Unforeseen problems developed, however. First, the deposit in combination with the fact that the loan covered vessel and engine, but not gear, meant that the fisherman had to go to private money lenders. Second, the new equipment deteriorated faster than the old, and there was no provision of maintenance funds. Third, loan repayment was not related to the value of the catch--it was a fixed monthly payment; thus, during off-periods the payment could exceed income. Nevertheless, production increased, so the government viewed the project as a success and invested more funds in it. The total income to the fishing village increased, but other, less visible problems also increased. Since the number of fishermen increased

little over the years since the innovation was first introduced, and the population increased, there was increased unemployment. New boats were introduced, but they rightfully went only to experienced deep sea fishermen. Important for our discussion, however, is the fact that inexperienced recruits were only drawn from relatives; therefore, few opportunities existed for those not related to the boat owning elite to acquire the experience necessary for allocation of a boat. The elite in the community is larger than it was in the past, but the large group of middle-class free peasants are finding life much more difficult, and there is now a substantial elite with the bulk of the population being reduced to the poverty level. Alexander (1975) suggests that since the elite have political power and control recruitment to the most favorable occupations, the degree of social stratification will become even more marked in the future. Increases in social stratification have been attributed to similar factors in other communities where costly innovations were introduced (cf. Norr 1972).

Ironically, in some communities attempts by change agencies to introduce costly fishing technology in a manner which would possibly reduce the potential for increased social stratification by going around traditional equipment owners and money lenders have failed due to the fact that fishermen viewed the traditional patron-client relationship as legitimate and the government's planned intervention as illegitimate. For example, Emmerson (1975) describes a development program in Indonesia where a more complex, expensive technology was to be introduced to indigenous fishermen using a plan wherein crewmen would collectively own the equipment. Traditionally, crewmen were bound to a boat by an interest free permanent "loan" provided by the boat owner. The boat owner was bound to a moneylender by a similar arrangement. According to Emmerson, the participants did not perceive the relationship as exploitative--it was one of reciprocal obli-

gations, freely engaged in, and viewed as being fair. When this traditional system was threatened by the introduction of the new equipment, the fishermen destroyed the equipment and assaulted a project administrator.

Related attempts to inhibit development of social stratification involve the establishment of fishermen's cooperatives. It was mentioned in the previous section that the introduction of a new institution, the fishermen's cooperative, is often viewed as the ideal means for improving small-scale fisheries while reducing the potential for increased social stratification. In some cases, marked success has been reported (FAO 1971) and in others, failure (UNRISD 1975). The successes have led many governmental and international aid organizations to make release of development funds contingent upon formation of fishermen's cooperatives for management purposes. It is thus important to examine sociocultural aspects of success and failure of fishermen's cooperatives among small-scale fishermen.

Proposed fishermen's cooperatives often take the form of a marketing cooperative in an attempt to do away with the much maligned middleman. The middlemen, however, often resist these moves because they would lose their livelihood if marketing were taken out of their hands. Further, if they form part of the fishermen's kinship network, which is sometimes the case as was noted above, fishermen would be sympathetic with their resistance and continue the old marketing patterns. Fishermen are also frequently reluctant to switch to selling through the cooperative because they are often indebted to middlemen for supplies of capital in times of need (cf. Firth 1966). Thus the role of the middleman in the social organization of fishing communities cannot be underestimated in attempts to replace him with a marketing cooperative. The periodic nature of marine resources often places him in a role of benefactor to fishermen when the catches are light, and his ability and willingness to give loans when the sea destroys or damages productive equipment reinforces this role. If fishermen's

cooperative organizations are to succeed, they must manifest the same type of flexibility to match the periodic nature of the marine resource. For example, Blake (1977) suggests that Madras fishermen in India were reluctant to use cooperative marketing schemes because the marketing cooperatives unlike the traditional middlemen did not make loans for weddings, funerals, holidays, and expenses incurred during unproductive periods.

Fishermen's cooperatives have also been introduced with part of their function being elimination of traditional village money lenders (often but not always the middlemen). Alexander (1975) provides a good example of the problems associated with one such cooperative. He notes that in Sri Lanka new fishing gear was introduced, sometimes through cooperative organizations, which was of relatively high cost and subject to relatively rapid deterioration in contrast to the traditional gear, which lasted longer and could be replaced out of current earnings and small loans. The new gear thus required making provision for replacement. Nevertheless, no provisions for replacement were made, even in cooperative organizations. The form of the fishermen's cooperative organizations were transferred directly from farming where the major resource, land, appreciates through time; thus, failure to take the basic technoeconomic differences between farming and fishing into account resulted in difficulties. Another feature of the marine environment also has an adverse effect on cooperative operations. The short term periodicity of marine resources results in variance in catch and, subsequently, in income through time. Loans made by the government to Sri Lanka fishermen failed to take this fact into account--the required payments were inflexible, appearing monthly irrespective of catch size (Alexander 1975). Middlemen in most fishing communities have had a long relationship with fishermen and their adaptation to the sea; thus, they understand these environmental constraints and usually act accordingly, adapting to variability of catch

by permitting more flexibility in repayment of loans. Thus, wholesale transfer of cooperative organizational forms from other fields of production to fishermen's organizations without accounting for the sociocultural and environmental constraints exerted by the marine environment can result in serious problems.

A proper understanding of the idea of a fishermen's cooperative on the part of potential or actual members is also an essential element in cooperative success. Davenport (1956) notes that a Jamaican fishermen's cooperative which failed consisted of individuals who really did not understand the idea of a cooperative. The idea behind such an organization had not been properly communicated to them, and Davenport suggests that since the captains had the most to lose from the successful operation of the cooperative, they might have been motivated to keep such information from the fishermen. Davenport also notes that cooperative meetings, in the community where the organization failed, conveyed the moral tone of a church meeting and thus inhibited members from initiating interesting activities such as gambling around which a stable group could be organized. The problem of communicating the idea of a fishermen's cooperative has been emphasized by Pollnac and Ruiz-Stout (1977b) who found a great deal of variability in knowledge concerning the role of fishermen's cooperatives among fishermen in Panama. They suggest that such variability can lead to problems in instituting and maintaining this form of organization due to varying expectations on the part of participants. They thus argue for the development of effective techniques to communicate the total meaning of a cooperative in areas where they are planned or in operation.

Fishermen not only need to understand the goals, operations, and structure of proposed fishermen's cooperative organization; they must also be provided with a realistic picture of what to expect and when to expect it. Numerous times I have heard the complaint that "A year or two ago someone else was out

here asking questions and telling us we would get new boats, but nothing ever happened." Small-scale, rural fishermen are not aware of the bureaucratic labyrinths that often delay development projects, and many change agents do not take the time to inform them of these problems. Thus, rising expectations are frustrated and change agents often fail to obtain cooperation in future projects. For example, Sabella (1974) notes that a fishermen's cooperative in Peru failed when government red tape slowed-down delivery of motors, and the facts concerning the delay were never properly communicated to the members. In Panama, a FAO/BID artisanal fisheries development project stimulated fishermen to begin forming cooperatives in 1974, and the formation of these cooperatives was well underway in 1975 (cf. Pollnac 1977a). By early 1978, however, the cooperative members were becoming disillusioned because the money for equipment and facilities had not yet been released. Nevertheless, fishermen were still being told that it would happen any day.

Sometimes the funds provided for fishermen's cooperative organizations are insufficient or improperly utilized. Norr (1972) writes that a fishermen's cooperative in southern India acquired a small amount of money for loans, but problems soon arose concerning who would obtain the money. Thus, it was equally divided among all members. The resultant shares were not enough for equipment and were spent on food and drink. Another example is provided by Firth (1966) who notes that Malay fishermen were rejecting government cooperatives because the government refused requests for equipment and loans. It turned out that the government was refusing because in one area many fishermen had defaulted on loans. These defaults, however, were the result of failure to adequately check the abilities of applicants. It appeared that some defaulters became cooperative members solely to obtain loans.

This problem is not unique to Malay fishermen. It appears that the commonly

accepted procedure of releasing development funds through cooperatives has led to abuse in other regions as well. In some regions where the author has worked, the idea of a fishermen's cooperative was readily accepted by the fishermen. Nevertheless, when delays in funding and early managerial problems began to develop, the better fishermen began to drop out of the organization. In one region (to remain unnamed) the fishermen's cooperative and its members had a poor reputation among better fishermen. Very few active fishermen were observed landing fish at the cooperative dock. In a recent return visit to the area, however, the author was surprised to be told that the cooperative had some 200 members. Upon further questioning it was determined that most of the members were "inactive", i.e., not fishing, without equipment, etc. The members are thus among the most inefficient fishermen in the area; nevertheless, a great deal of funds will soon be released to buy equipment (boats, motors, and nets) for these "fishermen" to use. Release of these funds was contingent upon formation of a cooperative organization, and the credentials of the members did not seem to matter; thus, a situation similar to that reported by Firth (1966), and summarized above, is likely to occur.

A further problem with respect to the continued success of fishermen's cooperatives after their formation lies in the area of management. Too often, change agents idealistically believe that the skills required for running a cooperative can be found among the fishermen themselves. Perhaps they can in some instances, but a cooperative is a complex business and needs to be run by a competent manager. For example, Spoehr (1954) writes that a cooperative venture by Carolinian fishermen failed because the operation required managerial skills beyond their traditional cooperative patterns. In addition, Pollnac (1977) discusses several cooperatives which failed due to managerial problems. Nevertheless, salaries offered for the position of cooperative manager are often

not sufficient to attract qualified applicants.

Traditional workgroup structure and other aspects of community organization can also be factors related to the relative success or failure of fishermen's cooperatives. For example, Davenport (1956) in a study of two Jamaican fishing communities notes that a fishermen's cooperative succeeded in one and failed in the other. He notes that the successful cooperative duplicated the basic social organization of the community--natural interacting groups filled the roles in the cooperative. Existing social structures such as kinship groups also seem to be important elements in cooperative success. UNRISD (1975) reports that cooperatives using existing kinship structures and local leadership obtain more positive results than others. We have commented upon the role of kinship in fishermen's workgroups above, but it should be noted that the most independent and successful fishermen's cooperative in the Republic of Panama is one formed around a kinship core. Further, in Chile where there has been little success instituting effective small-scale fishermen's cooperatives, a recent experiment involving formation of small cooperatives around kinship cores appears to be succeeding. It seems, therefore, that effective use of existing social organization may facilitate formation of fishermen's cooperatives.

It thus appears that the fishermen's cooperative, an organization which is held by many to be the ideal vehicle for introducing planned change into fishing communities while in the process avoiding increased social stratification, is thus susceptible to many obstacles which may inhibit its success. It is apparent, however, that a knowledge of small-scale fishing societies and cultures can help overcome some of these obstacles and aid in insuring the success of this important institution.

DISCUSSION AND CONCLUSION A model illustrating the relationship between small-scale fisheries institutions and technology and aspects of social organization was developed and examined in relationship to problems associated with fisheries development programs. Although most of the examples examined had negative effects, this is not to be interpreted as meaning that given certain social facts, fisheries development cannot occur. In fact, an understanding of the social organization associated with the small-scale fishermen within a region targeted for development can aid in developing realistic programs which will enhance the probability of sustained development. It is only by understanding the existing social organization and working within it that changes can effectively take place--changes not only in technology, but in aspects of social organization that inhibit change. Additionally, an understanding of local social organization facilitates involvement of fishermen in early stages of the development program; thus, further increasing potential for project success (cf. Morss, et al 1976).

In conclusion, it must be noted that social organization is not necessarily the key variable associated with technological change among small-scale fishermen (cf. Pollnac 1976), but it can affect project success just as severely as other factors associated with technological change (e.g. funding, natural resources, infrastructure, etc.).

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