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THE CULTURAL AND EVOLUTIONARY SIGNIFICANCE OF
FISHING SOCIETIES: An inquiry into social
characteristics of fishing societies and the
origins of agriculture.

By

Phillip J. Bird.

A thesis submitted to the Faculty of
Graduate Studies in partial fulfillment
of the requirements for the degree of
Master of Arts.

Department of Sociology and Anthropology
Carleton University
Ottawa, Ontario
October, 1985.

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ABSTRACT.

This thesis explores the possible role that the use of freshwater aquatic resources had on the origins of agriculture. The cultural and evolutionary significance of fishing societies is examined with ethnographic and archaeological data, and in terms of marxist and evolutionary theory.

The social and technical differences between foragers and farmers is explored within the framework of historical materialism. This overcomes the weakness in many models of agricultural origins by emphasizing the social relations of production. The analysis contests the traditional view of foragers evolving into farmers. The qualitative differences between the two is supported by ethnographic examples.

An important contribution is made to the understanding of fishing societies. The archaeological record shows an increased reliance on aquatic resources prior to the development of agriculture. The present anthropological understanding of fishing is considered, and a cross-cultural analysis of freshwater fishers and foragers is presented. It indicates such fishers tend toward greater social complexity than terrestrial foragers. This supports the hypothesis that fishing provided a fertile context for the initial development and diffusion of agriculture. The applicability of the cross-cultural method and its utility for generating statements relevant to problems in prehistory and social evolution are also examined.

wife's kin and was then able to cultivate even more land. It is unclear how long this strategy may last or what its chances of success are. In attempting to preserve good relations with his kin, this farmer was making less of a commitment to farming. He adopted the technological dimensions of the enterprise but refused the necessary social relations.

In times of ecological stress the San revert back to foraging while the more established systems of farming and herding of the neighbouring Herero and Tswana persist. We must not suppose, however, that the Herero and Tswana persisted as farmers and herders because they lacked the knowledge of foraging. On the contrary, the Herero, for example, once gained between 36 and 45 percent of their subsistence from wild resources (Murdock 1967).

The Ik of Uganda provide another example of the cultural lag inherent in the social relations of foragers. They also provide an example of a culture under stress and may serve to test the notion that agriculture was born at a time of ecological disequilibrium.

Though known traditionally as mountain hunters, the Ik practiced a form of vegeticulture prior to their shift to a vigorous form of terraced farming on the slopes of Mount Morungole and on the escarpment above Turkana land (Turnbull 1967, 1972). Early reports describe them as hunters but note the practice of some agriculture (Wayland 1931:212-8; Gulliver 1953:97-9). Not until they were denied access to traditional hunting territories in Kenya and Sudan did they become known as

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CHAPTER ONE

Introduction.

Within the fields of archaeology and anthropology there has been a long debate over the factors and conditions that gave rise to agriculture. Far from being resolved, there have been a number of hypotheses presented that suggest that following the Pleistocene, climatic and habitat changes, and/or population growth and demographic disequilibrium were primary causes (Wenke 1980:289-301)). It has been difficult, however, given our understanding of modern foraging societies, [1] to theorize the social processes involved in such a change. Today we see a variety of social, technical, and biological mechanisms that affect the ecology of modern foragers. The cultural response to these suggest that given any environmental or demographic changes, the resulting adjustment will still be in pursuit of a foraging way of life. Clark and Brandt (1984:5) note that such resistance to change appears to be a characteristic of all foraging populations.

In this paper I will contest the general view that terrestrial foragers evolved into farmers. I will argue, however, that within the specialized foraging activity of fishing, suitable social and ecological conditions existed which can lead to domestication and agriculture. That the transition from foragers to farmers is unlikely can be understood in terms of the

structural differences identified from a theoretical analysis of these societies. This problem of transition is also evident from the ethnographic record. This record suggests that fishing cultures may be a fruitful avenue of inquiry into the late Pleistocene early post-Pleistocene problems of social evolution. The archaeological record is also suggestive of the significant role fishing activities may have played in human history.

The shift to farming is generally understood to entail a change from nomadism to sedentism, from communal diffuse ownership to family or individual ownership, and from sharing and generalized reciprocity to saving and the husbandry of resources [2]. This often involves a sacrifice in personal liberty, the reorganization of the social system, and a reduction in the nutritional quality of the diet. Initially there may also be a decrease in technological complexity since, prior to the plow, the digging stick would have served as a simple, though suitable, implement. That there is resistance to such changes is not surprising. They are revolutionary in that they demand fundamental alterations to the relations between man and nature and to the relations among men.

In a discussion on horticulture, Y. A. Cohen (1968) notes there are fundamental adaptations and adjustments that cultures must make so that their social systems are appropriate to the technological innovations that come with the emergence of a new subsistence system. The technologies involved with early farming were probably simpler than those of existing foragers. But the

shift in the relationship with the land was of great evolutionary significance. Social adjustments involved reorganized labour, redefined access to the means of production and modes of distribution, and redefined socioeconomic status. But it is in these social spheres that people tend to exhibit their most fundamental resistance to change. Thus the transition from foraging to farming must be viewed as a gradual process (1968:121-2) [3]. Clearly, changes of this nature cannot simply be viewed from a purely technical perspective but must involve the social dimension.

It is this very perspective, however, that is lacking in the current hypotheses concerning the origin of agriculture [4]. The social dimensions of production cannot readily be understood from a purely mechanistic perspective of cultural change. Environmental factors, energy efficiency, population pressure, and the like, cannot account for the dynamic interaction that the social dimensions of production must have on cultural change. In recognizing the use of symbols and symbolic structures as crucial aspects of human culture, one cannot then ignore them when modeling change. Ethnographic data illustrates that within pre-capitalist societies the economy is not an institution by itself but is a part of the symbolic systems of kinship, politics, and religion. There is no clear analytical distinction between these latter institutions and the processes of production and reproduction.

To view the transition to agriculture as merely the

interaction of human populations [5] with their environment, is to recognize only one dimension to the problem. One must also account for the dynamic interaction between the relations and forces of production that constitute any mode of production. As Faris notes (1975:237), to focus on the forces of production is to look at the consequence and not the cause of the productive activities. Thus, to understand better the problem of agricultural origins, a more balanced perspective is needed.

To this end, I will argue that the perspective of historical materialism can lend insight to the problem. This framework provides a suitable analytical distinction between foraging and farming. It also recognizes the qualitative and quantitative differences between the two. Meillassoux (1973:201) notes that the differences are so great that it is difficult to theorize the evolution from foragers to farmers. The concept of the foraging mode of production, as it is being developed for contemporary societies, has not addressed the problem of what kind of mechanism or logic would be necessary for an internally generated change to a new mode of production. The long-term stability and persistence of the foraging mode through the millennia attests to its resistance to structural change. It has been difficult to document within these societies those contradictions which might have led to a qualitative change in subsistence [6].

Such findings beg the question of what type of society should be sought as a theoretically suitable originator of agriculture. It is suggested here that fishing societies are distinct enough

from terrestrial foragers to warrant an inquiry into the nature of their production as it may relate to agricultural origins. This notion is not new. Carl Sauer (1952) suggests fishing folks living in a mild climate along freshwater may have been the first agriculturalists. He proposes Southeast Asia as a probable region for such developments. Lathrap (1977), however, suggests that cultivation developed independently in Africa along alluvial flood plains of tropical rivers in conjunction with an increased reliance on riparian resources. He acknowledges Sauer's argument that agricultural systems derive from a "single localized pattern of Neolithic experimentation", but argues Sauer was wrong in locating that pattern in Southeast Asia (1977:716). Claude Meillassoux (1973) also acknowledges Sauer when he concludes hunting societies may be unable to develop into any other mode of production.

Within fishing societies, food is collected and not produced. As such, they are usually defined at a technical level as foragers. Nonetheless, they maintain social relations more compatible with those of farming. The societies of Canada's Northwest coast provide a ready illustration of this. The marked social inequality, high development of chiefly institutions, and the presence of slavery are characteristic of non-foraging societies. Lee (1981:18) argues these societies no longer maintain the social logic of a foraging mode of production but rather, are Proto-Tributary social formations. Such Proto-Tributary societies have in motion a set of internal

dynamics that inevitably push the political economy towards class-divided politics. Lee's hypothesis should be examined in the context of agricultural origins, since it rightly emphasizes the social characteristics arising from sedentism, territoriality, and the organization of production and reproduction.

Though I take advantage of the analytical utility of historical materialism, I do not wish to use the framework to develop a mode of production for fishing societies. Throughout this paper, fishing is understood to be a specialized foraging activity. The use of historical materialism is meant to contribute to our understanding of the logic of the mode of production of foragers and farmers. The mode of production concept serves as a heuristic device for understanding the social processes necessary for the rise of agriculture. I will not argue that agriculture is an inevitable outcome of a fishing mode of production. My purpose is to understand the differences between foragers and farmers, and to demonstrate the common social characteristics in the organization of fishing and farming. To this end, the analysis of fishing in the context of agriculture will be broad, drawing upon ethnographic and archaeological data as well as from marxist and revolutionary theory.

The following chapter (CHAPTER TWO) presents a marxist analysis of the differences between foragers and farmers. In CHAPTER THREE the archaeological record of the late Pleistocene

and early post-Pleistocene, is surveyed for evidence of fishing activities in the locales of early agriculture. The ethnographic data on fishing societies is explored in CHAPTER FOUR. This chapter takes, in part, the form of a cross-cultural survey of 18 freshwater fishing societies. They are compared with the social characteristics of 36 foraging societies. With this cross-cultural approach it is hoped general statements can be made that better serve discussions of social evolution and which are also relevant to issues in prehistory. The cross-cultural method reduces the biases inherent in using selective ethnographic examples.

The discussions here will address the development of agriculture and will largely ignore the processes of animal domestication for sake of manageability. Our interest is in the conditions that gave rise to, and the consequences of, changing ecological and social relationships. This is readily highlighted within agricultural systems.

There are problems, however, with all the forms of data presented in this thesis. The archaeological record is incomplete and is not readily amenable to an inquiry into the subsistence contribution from fishing at the time of agricultural origins. The task of developing a marxist analysis of pre-capitalist societies is still in its early stages. There is no single school of thought or clear analytical model for analysis. The work to date highlights a qualitative (and quantitative) distinction between foragers and farmers. Finally, the anthropological and

ethnographic data on fishing societies engaged in subsistence or non-market economies is wanting. It even proves difficult to identify them in cross-cultural studies. Nonetheless, these data indicate that fishing is a significant and widespread subsistence activity. Yet this point is largely ignored in terms of social evolution.

The following chapters present three different bodies of information which bear on the question of agricultural origins. The hypothesis presented here serves only as an initial exploration into the problem of origins. The questions involved are complex and not all can be answered. Nonetheless, the final chapter will assess what the foregoing tells us about social evolution, agricultural origins, and the problems of an inquiry of this nature.

ETHNOGRAPHIC EXAMPLES OF FORAGERS BECOMING FARMERS.

The next part of this introduction serves as a brief inquiry into what the ethnographic data reveal about foragers who are becoming farmers. The examples we have today of foragers making a transition to farming fail to parallel the 'in situ' agricultural revolutions of Southeast and Southwest Asia, and Central America. For many modern foragers the shift to farming stems from agrarian encroachment and/or the pressures from government and private enterprise to participate actively in agrarian and market economies. These cannot explain how and why farming first evolved. Nonetheless, they illustrate the

quantitative and qualitative changes necessary for a society to successfully adopt a new subsistence strategy.

The !Kung San in Botswana are a case in point. Lee (1981:16) notes in this connection that although over 100 of 151 San men surveyed had attempted farming, in the end few were successful. Lee isolates the failure to the fundamental contradiction between the social 'logic' of foraging (sharing and egalitarianism) and that of farming. Lee's informants readily adopted the technical dimensions of farming and herding, but not the style of social relations that would favour success.

Lee makes his point in two brief case studies. They serve to highlight the contrasting logic of foraging and farming. In order for one San farmer-herder to conserve his stock and harvest for the coming year he refused his foraging kinsmen ready access to his surplus and discouraged them from extended visits. That he had a surplus and wished to husband its consumption was a measure of his technical success as a farmer. Within the social realm of foraging, however, he became known as stingy and was accused of witchcraft. "In exasperation", Lee (1981:17) explains, "he sold all his cattle and all his grain... and moved out of the area".

In a second case study, a !Kung farmer shared his surplus with his visiting relatives and consumed the entire year's harvest within weeks. But, in having shared his produce with so many, the farmer and his family were welcome in many foraging camps and enjoyed reciprocal hospitality until the next planting season. On returning to his land he was joined by some of his

wife's kin and was then able to cultivate even more land. It is unclear how long this strategy may last or what its chances of success are. In attempting to preserve good relations with his kin, this farmer was making less of a commitment to farming. He adopted the technological dimensions of the enterprise but refused the necessary social relations.

In times of ecological stress the San revert back to foraging while the more established systems of farming and herding of the neighbouring Herero and Tswana persist. We must not suppose, however, that the Herero and Tswana persisted as farmers and herders because they lacked the knowledge of foraging. On the contrary, the Herero, for example, once gained between 36 and 45 percent of their subsistence from wild resources (Murdock 1967).

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farmers [7]. They still maintained their foraging endeavors to supplement their farming, and, in fact, reverted to it on a full-time basis every four or five years because of drought and crop failure (Turnbull 1968).

At a technical level the Ik maintained all the elements of successful farmers, in contrast to their band level of social organization. They occupied stockaded villages of a Karimojong-style, moving them every two years as they did their fields; fallowing was for about four years. They had granaries for storing crops (sorghum, millet, maize, and pumpkins), built dams and dikes, and occasionally kept goats and cattle (Turnbull 1966, 1967, 1968; Gulliver 1953). They still were widely known for honey gathering and hunting as well as their trade in tobacco, grain, and gourds. Of interest is their social organization which still followed the principles of foraging bands. Villages were almost as autonomous as hunting bands and were not organized along formal lines of kinship; alliances and divisions were not necessarily permanent. Though clan membership was recognized in terms of allowable marriage alliances, marriages within a clan did occur. Formerly monogamous, the Ik adopted the custom of polygamy though it was uncommon and in general, they maintained no strong patrilineal or patrilocal settlement patterns (Gulliver 1953). The nuclear family continued as the unit of production and cooperation and there was communal labour in the building of houses and irrigation systems. In a sense, the same principles of flux recognized within hunting

societies appears within the Ik farming society, (Turnbull 1968) [8].

The Ik provide an interesting example of a society in transition; they present to us a blend of productive strategies that at times seem anomalous. Their organization is not complex and appears suitable for the instantaneous production of foraging, but is not what would be expected of terraced farming which demands cooperative labour directed towards a deferred return. There are hints, however, that the Ik were adopting a more complex system with the recognition of clan affiliation, the practice of polygamy, and in the payment of bride-wealth. It is unfortunate that the political and environmental conditions of the 1960s prevented an extensive study of the Ik during this phase. By the time Turnbull conducted his research, adverse conditions had forced the Ik into a third phase. Neither foraging nor farming could sustain the population and a complete breakdown of their social system resulted (Turnbull 1972). Adverse administrative and ecological conditions prompted a thorough and abrupt disruption of their economy and thus prevented the validation of regular social controls and standards; regular social norms became economically untenable (cf. Leacock 1978:249).

It is difficult, given the incomplete ethnographic record, to assess the factors influencing the evolution of the Ik social and productive systems. Was the persistence of foraging social relations simply a response to periodic famine or was it more the

result of ideological preference for the "old ways"? And what factors nurtured the trend towards more complex social relations? Some can be understood as a result of diffusion from neighbouring pastoral societies but their acceptance may have hinged on the changing Ik relationship with the land. It would be difficult to demonstrate such a causal relationship. Both the foraging and farming elements in the post-hunting, pre-famine Ik society could be explained in terms of their ecological base. In the end, the Ik illustrate the social and material uncertainties that must come with a change in subsistence strategy. This example, however, provides little evidence of how complex systems could evolve under 'natural' conditions.

With foragers, the relations of production are the means by which people are able to reproduce the structure of their social relations through the years and generations (Lee 1981:15-6). Since this involves structured dimensions of underproduction (Sahlins 1972:41-99), the relations of production of foragers (and even of simple farmers) tend to be opposed to those of more advanced and complex farmers. When it comes to a shift to farming the foraging relations reveal themselves as conservative and as such, resist change.

At this point there is little known of the transition back from farming to foraging. There are, however, some examples: Steward and Faron (1957:378) note the Siriono of Bolivia and the Guayaki of Paraguay regressed from horticulture back to foraging. A prehistoric example of such a change is the Freemont culture of

Utah, Colorado, and Nevada (ca. 1250 to 750 years ago) (Carr 1977:679-86).

THE CONTEXT OF AGRICULTURAL ORIGINS.

The following is a brief review of some of the factors and conditions that relate to the archaeological problem of agricultural origins (cf. Bray 1976:77-8).

The close of the Pleistocene marks the end of the last Ice Age, and was followed soon after, with the appearance of agriculture in the archaeological record. Often interrelated and operating with differing emphasis in differing habitats, were climatic and eustatic changes, as well as floral and faunal changes. The details, and impact, of such ecological shifts are still in dispute. Such changes may have brought either improved or deteriorating ecological conditions to existing populations. Stahl (1984:19) notes, however, that ameliorating climatic conditions probably did not stimulate agriculture or its diffusion. Studies of modern foragers indicate the transition to agriculture can not be viewed as automatic since agriculture does not necessarily provide an inherently better subsistence. Population pressure in the form of growth (Roserup 1965; Smith and Young 1972), emigration (Binford 1968) and/or density saturation (M. N. Cohen 1977), has often been modeled as a response to the changes and as a factor initiating agricultural-type behavior at a regional and global level. These factors will be explored more fully in CHAPTER THREE.

Modern ethnographic examples show that foragers who have taken to farming tend to revert back to foraging when they face severe ecological stress. This would suggest that severe conditions do not foster innovation but favour reversion to tried-and-true strategies.

There are several examples of modern foragers who manipulate the reproductive processes and conditions of preferred plant species. As M. Harris (1979:86) notes, the Andaman Islanders avoid harvesting wild tubers during the regenerative season. Similarly, the Menomini avoid completely harvesting their wild grain and even scatter seeds at harvest. The Western Desert Australian Aborigines use fire to increase the abundance of certain plants. The Paiute divert melt water to irrigate favoured fields (cf. Bender 1978:205; M. N. Cohen 1977:21). Similarly, late Paleolithic populations of the Nile were collecting wild barley and wheat during a period of severe aridity about 18,000 years ago (Clark, Brandt 1984:6). Other prehistoric examples are noted by Higgs and Jarman (1969:40). These may be examples of domestication in process, but they do not imply agriculture as an inevitable outcome.

Agriculture is the result of a long and gradual process that could have spanned millennia. To become a system, a set of integrated activities had to evolve which affected the environment of the domesticates throughout their entire life cycle (Rindos 1980, 1984). The process of domestication began earlier, with the manipulation of preferred plant species. These

activities could not have been perceived by the actors as offering clear and substantial long-term benefits. That agricultural systems appear in the archaeological record after the Pleistocene does not readily indicate when domestication first began. The changing ecological conditions may have fostered strategies that led to symbiotic relationships with plants and animals or the process may have begun earlier, within the Mesolithic Broad Spectrum Economies. By the time the archaeological record indicates a substantial subsistence source from farming, the appropriate, and complementary, social relations must also have evolved.

Time is a critical dimension to this problem. It is unclear how long agriculture took to develop. Archaeological models may be endowed with a deep time frame and this cannot be easily reconciled with the slices of time available from the ethnographic data. The latter nevertheless, can be of heuristic value when interpreting archaeological data. In some regions, agriculture spread rapidly and maybe it is this that can be best understood with ethnographic data. What is needed is a measure of how long it takes a culture to adjust technically and socially to an (introduced) change in subsistence. Once agricultural systems were developed, perhaps in fishing communities, the strategy may have become widespread through diffusion. A possible mechanism for such diffusion may have been population growth stimulated by more sedentary settlement patterns (cf. Sussman 1972), or by greater intercommunity contact through trade.

What follows is a more systematic exploration of the possible role fishing activities may have had in social evolution. The effort is to highlight the significant structural differences that occur between foragers and farmers, and to demonstrate the increasingly important role fishing activities played during the late Pleistocene and early Holocene. With this background, the ethnographic data on fishing societies will be presented. It is important to explore the anthropological understanding of fishing, especially in terms of its evolutionary significance. Also developed are general statements about fishing communities from available cross-cultural data. The cross-cultural method is a useful tool for inquiries into social evolution and therefore its utility is also examined. It is hoped that all this divergent data will make a strong case for the idea that a profitable avenue of research into the origins of agriculture may be found among those cultures that exploited aquatic resources.

CHAPTER TWO

A Marxist Analysis of Foragers and Farmers.

The main purpose of this chapter is to demonstrate within a marxist framework the qualitative differences between the foraging and farming forms of production. Key distinctions can be made from the writings of Marx and Engels but discussion must turn to more recent interpretations. Marx's interest in pre-capitalist societies was in their historical relations to capitalism. He was not interested in developing an analysis of pre-capitalist societies. His investigation of them was relatively superficial, and the least developed of his work (Meillassoux 1972:96-7). Nonetheless, any analysis is to be rooted in the methodological framework of historical materialism (O'Laughlin 1975:354). Unfortunately, this task is far from a coherent process in that there is no single school of thought (cf. Coppans and Seddon 1978; Kahn and Liebera 1981). This has led to a diverse range of reformulations. I will not attempt to outline the whole of these interpretations, but will refer to some of the distinctions between foraging and farming made by various researchers. The analytical differences that are revealed should thus lend insight into the problems of agricultural origins.

Our interest in foraging, fishing, and farming in the context

of the Neolithic demands a focus on the least developed stage of pre-capitalist production, that of the primitive communist mode of production [9]. This is essentially a social label. Not all societies with the technical forces of foraging or farming can be understood by this concept. Obviously, not all farmers practice a subsistence economy, nor do all societies with foraging forces of production necessarily have egalitarian band-type organization. The cultures of Canada's Northwest coast readily illustrate this latter case.

Throughout this discussion I will refer to foraging or farming societies. Such terms refer to the technical forces of production. However, I do not wish to imply that they exist in such pure forms. Ethnographically, most societies exhibit a blend of productive strategies. It will be apparent from the discussion in the following chapter, that in its initial stages of development and adoption, farming contributed little to the existing hunting, gathering, and/or fishing economies. When it does become a predominant source, however, it is not at the ~~complete expense of the other strategies~~, for these must often provide complementary sources of essential foods (such as animal protein). The relative combination of such techniques is intimately related to the ecological setting. Thus when we discuss foraging, fishing and farming (or horticultural societies), I do not deny supplementary and complementary sources of food, but refer to the primary subsistence source.

Societies understood by the concept of primitive communism

are all recognized as natural or subsistence economies. Production is for use-value and is directed at meeting the limited needs of the producers, their families, and the community within which production and reproduction occur (Marx 1964:68). The social structure "... is based on the development and modification of the kinship group and its internal division of labour" (Hobsbawm 1964:27). Access to resources is mediated by membership in the community and is the right of all members. Labour-power and resources are bound together by social relations which are characterized by personal dependence. The production and consumption units are coterminous, in that within the unit of production are the conditions for its reproduction. These exist in the form of access to raw materials, instruments of production, and stock for consumption. The two units also tend to be homologous, being constituted along the same principles and mechanisms, and consequently being of the same size and structure (Terray 1972:152). By its nature, the internal composition of such units, its productivity, and its level of consumption can vary through time. These dimensions should not be considered rigid or immutable, but must vary according to circumstances.

Fundamental to societies defined by the concept of primitive communism is the communal mode of appropriation of surplus-labour. It should be recognized that all social formations [10] produce surplus-labour/products (defined as that over and above the necessary labour/products required to secure the conditions of reproduction of the labourer) since the

conditions for reproducing labour are not equivalent to the conditions for reproducing the economy. It is the mode of appropriation and redistribution of this surplus-product that serves as a central element in the definition of any economy (Hindess and Hirst 1975:26).

The notion of surplus is a controversial issue. Though it is recognized as an essential element of all modes of production, its existence within the primitive communist mode does not necessarily imply it has taken on the quality of value for exchange purposes (in the sense of a marxist understanding of simple commodity production). Rather, such surplus retains the quality of use-value and is produced simply to meet immediate consumption needs. Surplus production is constant in its orientation and is not accumulated to gain social advantage.

Within primitive communism, the level of production is such that there is no surplus-product sufficient to maintain a socially recognized class of non-labourers. Direct access to resources and the direct distribution of food and other necessities by the producers, provides no basis for authority in the form of control over resources (Hindess and Hirst 1975:22-9; Leacock 1978:249; Sahlins 1972:24). Decision-making is diffuse and informal and in no way fosters unequal relations within the group or community (cf. Leacock 1978) [11]. Relations of sharing and egalitarianism are seen as key characteristics of societies defined by this concept. Sahlins notes, however, that this factor of primitive solidarity is opposed by a "background"

element of anarchy and dispersion between productive units or households. The general under-use of resources and man-power do not exist in the context of rigid, institutionalized social relations, but rather in varying, transitory forms. Thus, in the background "is a discontinuity of power and interest, lending itself moreover to a dispersion of people" (1972:96). It becomes important then, to understand how such factors can influence the relations of production to stimulate higher production levels.

Not all societies with the productive forces of hunting, gathering, fishing, and/or simple agriculture can be understood by the concept of primitive communism. For example, the productive forces of horticulture can support a relatively simple egalitarian society or a large and hierarchically complex one (Cohen 1968b:49-50). Horticulture "in this sense should be understood as a semi-intensive agricultural method that is limited to vegetable gardens or groves of fruit trees (Murdock 1967:51). Variability arises at the ecological and social levels of production.

Recognition must be made of the mechanisms by which such social evolution can occur. A key factor seems to be the process of surplus accumulation. Within the marxist framework, this is akin to the concept of primitive accumulation. This is the social process of separating the producers from the means of production. The concept is linked to the historical formation of capital within pre-capitalist societies (Marx 1976:875). Engels (1972:233) argued that the process of domestication gave rise to

a shift from production for use to production for exchange and that this undermined the collective appropriation of primitive communism. As exchange between communities became institutionalized, appropriation and exchange by the individual became the norm. With this came the recognition of private property and ultimately the development of class exploitation. It is important to avoid any teleological notions in Engels' work and simply recognize that the mechanism for primitive accumulation demands conditions for controlling resources and increasing the level of production. Within the primitive communist mode of production the social and/or ecological contexts of production generally do not promote such conditions. The task is to theorize under what circumstances such mechanisms would operate.

With the advent of surplus production for the purpose of exchange, unequal relations are nurtured which undermine collective appropriation. Therefore, within societies where production and exchange are not for use or necessary consumption, but for social purposes (advantages), the society can no longer be understood by the concept of primitive communism.

At this point, an important distinction needs to be made between foraging and farming. The contrast is fundamental to the arguments presented here. Marx noted two possible functions of land: (1) as a subject of labour and (2) as an instrument of labour (1976:283-6). Foraging and fishing societies characterize the former. Production is instantaneous in the sense that there

is an immediate return on labour. The results of the labour are independent of previous investments (Meillassoux 1973:193). The labourer must simply separate naturally occurring products from their respective environments. Access to resources is usually direct with few intermediaries between labour and the means of production, and between the hunting or collecting of resources and their consumption. The immediate practice of sharing ensures the redistribution of the product to all community members. The unit of production tends to be the community or band. Appropriation is by the collective with little or no relationship between labour and reward (Hindess and Hirst 1975:43). Where achieved status is recognized, the individual's influence is ephemeral and dependent not on the accumulation of wealth, but on its distribution. Inequality in this sense is beneficial to the community (Sahlins 1972:134). Thus, within this system of distribution, relations of sharing and egalitarianism generally prevail. Within the process of production this distribution completes the enterprise, the labourers are free from further reciprocal obligations or allegiances in terms of the extractive process (Meillassoux 1972:98-9). Each productive undertaking is a repetition of the last, is of limited duration, and is discontinuous with the next (Meillassoux 1973:192-3).

When labour is invested in the land for a deferred return, land functions as an instrument of labour. Farming involves a different kind of relationship with the environment than that of foraging, and a concomitant difference in social organization.

Greater emphasis on time and continuity is necessary so that labourers can benefit from the delayed return on their joint labour as well as be provided for, along with non-labourers, between harvests (Meillassoux 1972:99). In situations where societies do not have a harvest season 'per se' but rather harvest different crops as they come to term throughout the year, there is still that delay between the act of planting and the return on that labour. In general terms, institutions must exist that serve to allocate tasks, control the storage and consumption of products for a period at least equal to a complete farming cycle, and ensure the resumption of work before the last harvest is consumed (Meillassoux 1973:198). The organization of labour for this kind of production may include differences in socioeconomic status. This can arise with a social division of labour. At its simplest, continuity exists between farming cycles in the form of seed-stock saved for the next planting season.

The sedentary nature of farming, its larger and more substantial settlements, and the need for more formal means of controlling interpersonal relations does not necessarily compromise communal relationships. Kinship continues to provide the organizing framework for productive relations but with greater inter-generational emphasis. On a day-to-day basis the domestic unit or lineage functions as the productive unit (Leacock 1972:32-3). The definition of social relations, however, based on the ideological criteria of kinship can be seen to evolve through quantitative changes to more complex hierarchical

forms. The process is one of concentrating power through control of resources. Within the foraging context of primitive communism this process is usually not possible since control is generally exercised by the community as a whole. Within the farming context the conditions exist but may not operate [12]. Once surplus product is accumulated to ensure social and biological reproduction between harvests, the potential exists for individuals to take control of that surplus and to promote increased production [13]. When such control is extensively exercised the society cannot be understood by the concept of primitive communism.

Faris (1975:243) suggests that many of the transformations in history may be traced to the recognition of the potential of labour. It could be argued that the structured underproduction of foraging prevented the realization of this potential. It also may not be immediately apparent in the context of simple farming activities though the ecological and social relations are probably more amenable to transformation. The shift from a system that cannot internally generate the evolution out of primitive communism to one that has the potential to do so may have involved the intermediate system of a specialized foraging activity such as fishing. In this latter context the ecological and social circumstances could have favoured the development of agriculture.

It would be too rigid an interpretation to assume that societies defined by the concept of primitive communism operate

in isolation. There may be a high degree of autonomy exercised, but the productive units are inextricably linked to larger spheres of biological and social reproduction [14]. The exchange of surplus derived accidentally, and even the production of goods of use-value for exchange, can occur between communities without undermining the relations of equality within the community. Such intercommunity relations are often in terms of marriage and lineage alliances. A clear understanding of the analytical utility of primitive communism, however, must rely on specific historical and cultural contexts. In general terms, and especially in reference to foragers, the concept is applicable to modern ethnographic societies (Lee 1981:15) and is also useful in reference to issues of social evolution [15].

For example, Lee (1981) in reference to social evolution, argues that even egalitarian farming societies maintain a structural dynamic which favours higher surplus accumulation and the positive definition of land ownership and that this is lacking in foraging societies. This dynamic pushes farming societies towards hierarchy and inequality and thus the egalitarian farming mode can only be a transitional system that is soon superseded by Big Man, Lineage, and Chiefly systems. The egalitarian systems operate effectively only at low levels of productivity. Lee only considers the effect of exogenous factors that transform foragers into farmers in the modern context and does not consider the mechanisms for an internally generated evolution out of foraging. However, he notes two possible

directions for such change. One is exemplified by the complex societies of the American Northwest coast, and the other involves a technical change into farming. The essential factor seems to be the level of development of the productive forces. Higher levels are made possible through either especially productive environments or the organization of labour for higher levels of production. It is unclear how the latter develops.

Marx discussed some of the alternatives that could develop out of primitive communism but did not provide any clue to their evolution (Hobsbawm 1964:32; Meillassoux 1972:97). The transformations out of the primitive communal mode of production probably occurred in the context of land as an instrument of labour and begs the question of the ecological and social changes that developed with a shift from foraging to farming within the communal mode. As noted in CHAPTER ONE, Meillassoux suggests that in light of "the radical opposition which exists between hunting societies and farming societies" a changeover from one system to the other may not be possible (1973:201). Other writers are less explicit on this point.

Hindess and Hirst (1975:41-78) for example, distinguish the two on the basis of their respective ideologically defined relations of surplus redistribution. Foragers are characterized by a form of simple redistribution that reflects the instability of the band's size and membership and the limited development of the productive forces. The network of relations are established only on a temporary or semi-permanent basis and are in the form

of 'elementary kinship relations'.

This ideological intervention into the economic level also occurs with farming but with greater emphasis on kinship. This allows a more precise definition of the relationship between any two members of the collective. This complex form of redistribution is established in advance of any particular labour process or any temporary group formation. It ensures the distribution of the product throughout a stable and permanent network of relationships that are in terms of a number of discrete statuses (1975:48). Reproduction of the economy thus requires reproduction of the kinship system since it is the latter that serves as a mechanism for surplus appropriation, and as a means of organizing labour. These relations are generated and sustained by determinant ideological social practices, rituals, and ceremonies.

Keenan (1981:6-9) is critical of Hindess and Hirst's conception of simple redistribution. He argues that they fail to specify the form of the ideologically conceived relations of redistribution, why it predominates, and how this governs band formation. It is unclear as to what kind of social relations favour band instability. Inadvertently Hindess and Hirst suggest the instability of band formations stem from an unstable resource base that prevents elaborate kinship relations from developing. They cannot demonstrate that a change from elementary kinship relations to the more stable and permanent relations of complex redistribution could explain the transition to agriculture. Only

with the development of the productive forces could complex relations be maintained. Thus among foragers there seems to be a qualitative break from farming, in that in the former, productive forces seem to dominate.

The notion that the productive forces are dominant among foragers is explicitly held by Meillassoux (1973). He argues that when material production is relegated to Nature, the relations of production cannot be dominant since their reproduction does not ensure the system's survival. Only with farming does the complex ideology for organizing relations between generations and gender become essential for social reproduction. The 'present orientation' of foraging production permeates all social phenomena including band organization, marriage practices, religion, and genealogical ties. These are all relatively informal and lack any real time depth.

On the other hand, Keenan (1981:10) and Godelier (1975a, 1979:82) support Marx when they argue that stable relations exist at the inter-band level and not at the level of the band. These relations need not be direct consanguineal or affinal relations but can be in the form of moiety organization, sectional systems, totemic groupings or name sharing. These are relations that are established in advance of any particular productive activity and encompass more than just the productive unit. Nonetheless, this still begs the question of how these ideological and kinship relations can transform foragers into farmers.

Though I will set aside the issue of what is the dominant

structure or instance in foraging production, this should not detract from the task of developing an inventory of significant social characteristics that are common to farmers and may be sought for among fishing people. Despite the significant theoretical debate, there is a clear analytical distinction between foraging and farming.

The mode of subsistence and the timing of the return on labour are critical differences (Kahn and Llobera 1981:289). With farming there tends to be a greater number of labourers and an absolute increase in the volume of surplus-labour (Hindess and Hirst 1975:55). Concomitantly, there tends to be a greater degree of sedentism. The organizational implication of a deferred return on farm labour is the greater emphasis on kinship as a means of defining ascribed status within the labour process. Kinship serves as a means of defining access to land and as a mechanism for continuity within the process of production and consumption. It also takes on greater geneological significance in the form of ancestral worship. Godelier (1979), Hindess and Hirst (1975), Keenan (1981), Meillassoux (1972, 1973), and Terray (1972) all recognize kinship as structuring the network of social relations of production within the farming mode. These are established in advance of any production process and preserves the productive unit during non-productive periods. Concomitant to this is the development and elaboration of the ideological aspects of kinship. Meillassoux (1973:198) argues this takes the form of an ideology of elderhood and serves to legitimize

political power. Ancestors thus emerge as political and religious figures. This is also recognized by Godelier (1975b:84) and Hindess and Hirst (1975:57).

Farming also favours a greater degree of task specialization and the emergence of commodity exchange. Ceremonial activities may also exist that are independent of immediate production. Hindess and Hirst argue these developments are linked to the higher levels of production associated with farming (1975:57). I would argue further, that these developments are associated with the specific ecological relations that appear with the advent of land as an instrument of labour.

With these differences in mind, discussion will now turn to fishing peoples. In the next chapter the prehistoric archaeological record for fishing is examined. This record indicates that fishing had become a significant activity just prior to the advent of agriculture. Following this discussion is a presentation of the ethnographic data on fishing cultures. The distinction between foragers and farmers, developed from our theoretical analysis, will serve as a means of measuring the organizational complexity of fishing societies.

CHAPTER THREE

The Archaeological Record for Fishing
and the Domestication of Plants.

The following discussion addresses the archaeological record of the late Pleistocene and early post-Pleistocene era. The intent is to highlight the evidence for an increased reliance on aquatic resources by cultures from the Upper Paleolithic through to the Neolithic. It will also be argued that most explanations for the origins of agriculture either ignore or make only passing reference to these data. The view here is that agricultural origins should not be modeled in a mechanistic, cause-and-effect manner, but rather as a long evolutionary product of the interaction between man and plants. It is suggested that within a fishing context suitable conditions existed for the processes of domestication to occur. It is unnecessary to model intent or invention on the part of man to account for this development (cf. Rindos 1980:752). The effort here is to demonstrate that fishing societies can be modeled as a viable alternative to the traditionally conceived sequence of social evolution from foragers to farmers.

The evolution towards domestication and agricultural systems need not be perceived as one involving a 'prime mover' in the form of changes in the climate or distribution of resources, nor

in the form of human population disequilibrium. These factors have all been presented and debated in the literature but have proved, on the basis of substantive and logical problems, to be unsatisfactory (Wenke 1980:289-301). As noted in CHAPTER ONE, the process of domestication probably took millennia to unfold. It is therefore an error to assume that men actively and consciously sought to manipulate the reproduction of plants and animals in an effort to either duplicate the occurrence of desired resources in what may have been marginal environments, or to increase their productivity and reliability in areas where they occur naturally. This is the outcome of the process and it would be teleological and an error in functional modeling to assume otherwise (Rindos 1984:27-8).

A more viable approach is to consider agriculture as one outcome resulting from the increase in human skills and technology and in the gradual trend to the more intensive exploitation of smaller areas of land, which had begun about 20,000 years ago (Polgar 1975:6). In favourable ecological circumstances more complex social systems could develop. Agriculture should not be seen as an invention nor a product of cultural readiness, but rather as a result of slow social evolution within specific social and ecological contexts. Logically, favourable conditions should foster long-term permanent or semi-permanent occupation of an area that is also inhabited by potential domesticates. A rich environment could also promote the complex organization of labour in terms of

Pleistocene, yet most origin models largely overlook this development. At best it is seen as a measure of man's increasing technological abilities. Ryder (1969:392-3) notes that fish bones have probably received the least attention of all animal remains, in part, due to the difficulty of identifying species. The chances of preservation, and the difficulty of recovering small fish bones, also may result in an underrepresentation of the subsistence contribution from fishing. In many cases we are left without clear statements on the subsistence contribution from aquatic resources.

EXISTING FRAMEWORKS AND MODELS FOR AGRICULTURAL ORIGINS.

Within the Western European archaeological record, fishing became a significant subsistence activity at the end of the Pleistocene (ca. 12,000 years ago). This roughly marks the end of the Upper Paleolithic and the beginning of the Mesolithic. That "there was a marked increase in the exploitation of aquatic resources and wild fowl... is practically a *definiens* (sic) of the Mesolithic" (Binford 1968:317). Other characteristics of this 'stage' noted by Binford include (1) a shift in the centers of population growth in response to changing ecological and faunal conditions, (2) greater geographical variety of cultural forms in response to specific local conditions, (3) the widespread technological development of the bow and arrow and the extensive use of microliths, (4) a trend towards the hunting of smaller game, and (5) a cultural degeneration when compared to the Upper

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Paleolithic.

This latter point is generally made with reference to the Upper Paleolithic Late Magdalenian hunter-fisher culture of France (ca. 15,000 to 10,000 P.C., G. Clark 1971:66). Subsistence was primarily upon reindeer, though there was a shift away from the exploitation of the classic Upper Paleolithic megafauna towards the exploitation of fish, sea mammals, and waterfowl (Ryder 1969:383). Fish gorges and fishing spears appear in the archaeological record for the first time (Childe 1951). The culture was highly artistic as evidenced by their cave art (Chard 1975:185; G. Clark 1971:61) and technically sophisticated in the manufacturing of tools of bone, ivory, and antler. The florescence of this culture is often attributed to highly favourable ecological conditions. The decline of the Late Magdalenian is attributed to deteriorating ecological conditions at the close of the the Pleistocene.

There is a general dissatisfaction, however, with the concept of the Mesolithic and its utility as an explanatory framework. Its definition stems largely from European material and is of limited use outside the area (Chard 1975:8) [16]. It is also recognized that there is a variety of post-Pleistocene adaptations, some of which constitute new technological innovations and others which are Pleistocene survivals practicing a largely Upper Paleolithic way of life. As well, the environmental changes of this period were variable from region to region, and defy any broad generalizations.

Chard (1975:197) classifies the post-glacial cultures into three categories: (1) short-lived Pleistocene survivals (epi-Paleolithic cultures), (2) more complex post-glacial adaptations (i.e., those generally considered Mesolithic), and (3) the incipient cultures that culminated in the shift to food production (eq., the Natufian and Hoabinhian cultures). This classification is not absolute. For example, Mellaart (1975:28) considers the epi-Paleolithic of Southwest Asia as comparable to the European Mesolithic. He classifies Chard's incipient Natufian culture within this category.

The late Pleistocene subsistence adjustments have also been described in terms of a 'Broad Spectrum Economy' (cf. Flannery 1969). This is a loose category, encompassing many of the cultural patterns included in Chard's latter two groupings. The broad spectrum economy is a useful concept of world-wide applicability. It implies a progressive shift to a broader subsistence base in place of the typical big game patterns of the Upper Paleolithic. It began about 20,000 year ago and continued until well after agriculture had begun (ca. 6000-3000 B.C.). This economy is often considered an essential precondition to agriculture. Though differing in detail from region to region, it involved not so much a shift from big game to small, but rather an intensification and diversification of the food procurement system.

The shift in Southwest Asia, from a big game to a broad spectrum economy, is described by Flannery (1969). It involved a

gradual increased reliance on fish, water fowl, mussels, snails, plants, and smaller game. The change was also accompanied by an increased use of ground stone technology and the use of storage facilities. In South America and Mesoamerica early post-Pleistocene broad spectrum economies included the hunting of small and medium size game, fishing, and the collecting of molluscs, lizards, snakes, bird's eggs, various insects, and a variety of plant foods (Bray 1976:89). In Southeast Asia the riverine oriented Hoabinhian cultures established a similar system of exploitation (Gorman 1971).

The broad spectrum shift was away from specialized hunting activities to a generalized exploitation of several environmental niches. Though the process was significant, it was undramatic, and took millennia to unfold. The cause of this shift is unclear. The transition is inextricably linked to the same problems that plague the question of agricultural origins. The broad spectrum shift, like the development of agriculture, lacks any easy causal explanation. They differ in that agriculture, once it became an established system, tended to narrow the resource base (Polgar 1975:3; Bray 1976:90; Rindos 1984:263). During its early stages, and in the preceding broad spectrum era, the trend was to a broadening of that base.

Climatic change has proven an insufficient stimulus to account for the broad spectrum shift, or the rise of agriculture. In Central and South America the late Pleistocene changes were relatively small and gradual and had little affect on the already

established broad spectrum economies (Bray 1976:81; Polgar 1975:5; Wenke 1980:269). In Southwest Asia the climate fluctuated; improving in some areas and deteriorating in others (Wright 1970, 1976). In this region the broad spectrum shift began before there were any significant climatic variations, and was not dramatically affected by such changes when they occurred (Flannery 1969:75).

Smith and Young (1972) suggest ameliorating environments would have led to increased sedentism and higher population growth beyond environmental carrying capacity, and thus the need for agriculture (cf. Sussman 1972). In some regions sedentism did pre-date agriculture (eg. Southwest Asia and Peru), whereas in Mesoamerica it occurred after maize was domesticated (Polgar 1975:5). It is unclear what role improved climatic conditions played in stimulating agriculture and its diffusion (cf. Stahl 1984:19).

The question of the origin and consequences of sedentism is a critical area for further study. Evidence for sedentism prior to domestication should not be used to make demographic inferences until relations can be clearly demonstrated between the two.

Population pressure, stimulated by many factors, has been variously theorized as pushing populations towards the development and adoption of agriculture. M. Harris (1979:87), for example, suggests that the shift to broad spectrum economies lowered protein rations and therefore altered birth spacing. It is argued that the decline in big game hunting led to an

increased reliance on carbohydrates in the diet. Physiologically, this favoured an increase in the ratio of body fat to weight among women, and a consequent decrease in the effect of lactation in suppressing ovulation. This change, in the biological mechanisms for controlling birth spacing, led to population increases that pushed foraging economies towards agriculture.

Binford (1968) argues that population pressure existed as a form of ecological disequilibrium which was stimulated by either (1) changes in the physical environment or (2) by a breakdown in the control mechanisms between a population and its resources. In the former case, rising sea levels could have reduced the amount of exploitable land thus increasing population densities beyond a region's carrying capacity. In the latter case, optimal foraging zones based on aquatic resources and/or migratory fowl could have favoured human population growth. Excessive numbers would have migrated from the region into adjacent sub-optimal zones creating disequilibrium which, in turn, fostered subsistence innovations. A breakdown in population control mechanisms is thus seen as a factor giving rise to agriculture.

The archaeological evidence suggests, however, that though there was a worldwide trend beginning in the Upper Paleolithic towards higher densities (cf. M. N. Cohen 1977), some of the earliest sites of domestication and agriculture appear "...in areas of extremely low, and apparently stable, population densities" (Wenke 1980:270). Also, when invoking population pressure as a causal factor one must account for why it had never

developed before, and if it had, why it did not result in agriculture.

Cowgill (1975:507) is critical of the notion that population growth and/or stress would have stimulated developmental innovations such as agriculture. There is enough evidence to suggest sudden shortages lead to death by starvation and disease, and not to social or cultural innovations. This was previously suggested in the ethnographic evidence of the !Kung and the Ik. The ethnographic data on modern foragers suggests that cultural controls on population levels would have intensified long before the carrying capacity of the environment was reached (Polgar 1975:6). Under pristine conditions it does not seem likely that ecological disequilibrium would foster subsistence innovations [17].

The preceding discussion has illustrated the archaeological complexity of the problem of transition from foragers to farmers. The old framework of Paleolithic - Mesolithic - Neolithic is inadequate. The regional variations in cultures that appear at this time defy any elaborate sequential classification. The mechanistic cause-and-effect models also prove inadequate. As well, the proposed modes of equilibrium and adaptation can be misleading. The best avenue is to assume a dynamic interaction between man and plants, which over time, led to the evolution of domesticated plants and the cultural systems to exploit them. In the initial stages, the effect on each would be negligible, and the outcome unforeseen by the human population in question. In

this light, the proposition that fishing activities may have played a significant role in the development of agriculture does not seem unreasonable.

The process of domestication probably began early, during the era of broad spectrum economies. Perhaps, in the context of a fishing economy, a greater reliance on stationary resources fostered a shift in the social logic of production. A rich and predictable resource base would not discourage the investment of labour into the land for a deferred return. This altering of the social relations of production is linked to the evolutionary process of domesticating wild plants. Once agricultural activities evolved, there was a fundamental change in man's relationship to the land. The change was innovative in that it allowed men to create social relations that recognized the potential of surplus production. With this came the potential for dramatic social evolution. These structural changes were explored more fully in the preceding chapter.

THE FRESHWATER CONTEXT OF EARLY AGRICULTURE.

C. Sauer (1952) was probably the first to present the notion that early domestication occurred in the context of a freshwater fishing economy. He argued that the earliest cultivators were well situated fishing folk who exploited abundant riverine environments in the mild climates of Southeast Asia. K. Chang has elaborated on Sauer's idea. He notes that "these fishermen led a settled, stable life and were familiar with their plant

resources and the nature and uses of many plants" (1970:180). The first plants to be cultivated had many purposes, being used for containers, as cordage for fishing lines and nets, as drugs and poisons, and as food. Continued and growing use of bamboo, bottle gourds, herbs, aquatic plants, wild fruits, berries, roots, and tubers eventually led to cultivation, though initially they probably formed only a minor part of the total subsistence (Chang 1970:180).

Lathrap (1977) is in agreement with Sauer as to the ecological context of early agricultural systems, though he sees the tropical rivers of Africa as a more likely center for domestication. He proposes, however, that the first domesticate was the bottle gourd (beginning about 40,000 years ago) and that it dispersed to other centers of domestication by 10,000 years ago. In Southeast Asia and in the New World there is little evidence for the wild ancestor of the gourd. With the systematic exploitation of reliable riverine resources and the trend towards sedentism,

... the artificial propagation of the bottle gourd and certain other technologically significant crops such as cotton and fish poisons imposed particular disciplines on man and in the context of these behavioral patterns all other nutritionally significant agricultural systems arose (1977:719).

The bottle gourd, thus domesticated as a technologically useful plant within the context of a fishing economy (as containers, net-floats, and musical instruments). These uses were conducive to the domestication of root-crops, which were the

first food cultigens, and the base of all subsequent cereal cultivation. Lathrap's discussion is ultimately directed to the South American domestication of bitter manioc in the alluvial zones of Amazonia and northern South America, but he suggests that yams were probably the first food cultigens to occur in Africa. For our purposes, it is significant to note that important ecological and social conditions are attributed to tropical riverine exploitation [18].

Though we are jumping ahead a little, it is worthwhile at this point to review the archaeological data of some early coastal fishing sites. They prove to be centers of early agriculture, but are regions where the cultigens were introduced. The best data comes from South America. Again Lathrap (1970:63-7) proves to be a useful reference; he argues there is little evidence favouring the origin of root crop agriculture from small coastal communities of shellfish collectors along either the Atlantic or Pacific coasts. The origins should be sought inland along riverine flood plains.

Evidence presented by Bray (1976:83-5) suggests early maritime sites are fairly stable and permanent. This indicates sedentism can precede agriculture. Engel (1973) for example, discusses the occurrence of permanent village settlements in the 'lomas' regions of coastal Peru (ca. 7000 B.C.). Subsistence was primarily dependent on Pacific maritime resources which were brought by the tón to the sites located 10-60 kilometers from the coast (elevations of 200-800 meters). By about 2500 B.C., crops

such as beans and cotton had been adopted, but these are of a domesticated form and are not indigenous to the area. Their domestication must have occurred elsewhere (cf. Bray 1976:76-7, 79, 84). Similarly, Zevallos et al (1977) present evidence of intensive maize cultivation along the Ecuadorean coast. This pre-dates, by 1000 years, the evidence from Mesoamerica and Peru. The lowest levels of the Valdivia cultures suggest the cultivation of an already efficient race of corn which begs the question of the locality of its domestication. The authors suggest the Cerro Narrio culture of highland Ecuador may have been where the process first occurred.

The data from the Old World is less clear. The coastal site of Franchthi Cave (Greece), for example, has a Mesolithic occupation (ca. 7500 B.C.) which, along with the usual large dependence on deer, included a subsistence contribution from fish, shellfish, and snails. Later levels (ca. 5900 B.C.) reveal that fully domesticated plants and animals were introduced to the area (Mellaart 1975:245). In the Levant, the incipient Natufian cultures show a settlement shift away from the coastal regions (ca. 10,000 to 8000 B.C.) to the more watered limestone uplands. The coastal regions were occupied by the preceding epi-Paleolithic Kebaran cultures (Mellaart 1975:30). In Southeast Asia the widespread Hoabinhian cultures occupied both inland and coastal sites. This culture provides early evidence of intensive plant utilization, though there is no evidence to show they were the domesticators of cultivated crops (Gorman 1971).

Gorman (1977) suggests this process took place in the piedmont zones of Thailand where both root crops and wet rice were cultivated together. The technological developments leading to domestication occurred in the riparian habitats along the now submerged Sunda shelf by about 9000 years ago. Tentatively, agriculture does not seem to have evolved within a coastal context [19].

Essentially, all the above data takes the form of negative evidence in that it tells us where domestication did not occur. If root crops were the first food cultigens and appeared first in tropical riverine environments, it is unlikely the evidence for it would have survived into the present. The conditions are just not suitable for the preservation of biodegradable material. Obviously more directed archaeological research into this problem is required. It is hoped the theoretical discussion of CHAPTER TWO and the ethnographic evidence presented in CHAPTER FOUR will lend insight into the nature of fishing economies and aid in interpreting the archaeological data of such societies.

THE PREHISTORIC SITES FOR FISHING AND EARLY AGRICULTURE.

The following review of cultures and sites that pre-date agriculture is to demonstrate the reliance on aquatic resources in the centers of agricultural origins. The evidence is suggestive. Given the state of our knowledge into the factors and conditions leading to agriculture, it does not seem unreasonable to assume that further investigation along these lines would

reveal more positive data.

In Northern China there is little evidence for the process of domestication (Chang 1970:182). The first farmers, however, were of the Yangshao period; they practiced a slash and burn type cultivation with an emphasis on cereals and seeds. They lived in nucleated settlements on the lower terraces of the tributaries of the Yellow River, and on isolated hills near small rivers. They depended for much of their food on fishing "as evidenced by the hundreds of hooks, fish gorges, and net weights found", as well as on hunting and gathering of wild plants (Wenke 1980:531). By 4000 B.C. village farming had become widespread. Ryder (1969:389) notes that during the early Chinese Neolithic (3500 - 2000 B.C.) there were at least two riverine cultures in which farming was supplemented by fishing and mollusc collecting.

In Southeast Asia, and specifically Thailand, there is also little substantive archaeological evidence on the first cultivators (Chang 1970:180). The widespread Hoabinhian cultures show evidence of intensive plant collection, but there is no convincing signs of domestication (Wenke 1980:303). Appearing in the Late Pleistocene (ca. 11,000 or 12,000 B.C.) and lasting until 3500 to 3000 B.C., the Hoabinhian was followed by a shift from intermontane and river occupation sites to lowland plain sites. Here, at such sites as Non-Nok Tha (ca. 5370 B.C.) and Ban Kao (ca. 3700 B.C.) there is the first evidence of Southeast Asian cereal cultivation. Prior to this development there is no evidence that the plains were occupied (Gorman 1977:342).

By 3500 B.C. there emerged early village farming. As Gorman notes:

Non Nok Tha and Ban Kao indicate the presence of lowland agricultural villages with a continuation of the hunting patterns associated with earlier Hoabinhian sites. Non Nok Tha is the most important here, for it evidences an early population shift to the lowland plains most probably triggered by the development of cereal agriculture. This was taking place just after the upland settlements began to be abandoned (1971:315).

The Hoabinhian culture terminates soon after the introduction of cord-marked pottery and ground stone technology. These innovations appear without developmental sequences (Reed 1977:911). Gorman suggests this new complex may have included domesticated rice (1971, 1977). He speculates (1977) both root crops and wet rice may have early origins at inland Hoabinhian sites. The most common location for such sites is in piedmont zones near streams and rivers. Aquatic resources contribute to the subsistence of 15 out of 18 sites described by Gorman (1971). The relative contribution from different resources is unknown. The orientation, however, was broad spectrum. Pig, deer, bovines, and primates were also commonly exploited (pigs and bovine figure prominently in subsequent lowland sites). Gorman comments that this sequence -- from a pattern of piedmont zone, broad spectrum exploitation to plains occupation, with domesticated plants and animals -- parallels the sequence in Southwest Asia (1971:311).

Chang (1970) presents a similar reconstruction, though mostly conjectural. He suggests that from a Hoabinhian substratum emerged a crude, cord-marked pottery tradition that became

widespread; characterizing pre-Yangshao cultures in northern China, the Jomon in Japan, the pre-Lungshanoid on what is now the island of Formosa, and the late Hoabinhian in Thailand. Subsequent development and expansion included the spread of rice cultivation. In Southeast Asia and south China the conditions proposed by Sauer (1952) were present. It is thus within the Hoabinhian cultural remains that the archaeological evidence for the early cultivators of this area should be sought (Chang 1970:180-1).

Southwest Asia is an area offering more substantive evidence of the process of domestication. The exact locales and conditions leading to its appearance in the record, however, are still points of debate. The area is geographically diverse and offers data widely spread in space and time. Nevertheless, the predominant Upper Paleolithic exploitation of a few ungulates such as gazelle and wild cows, gave way, sometime after 20,000 years ago, to a broader subsistence base. In the region of the Mediterranean this occurs during the Antelian culture, and in the Zagros Mountains during the Baradostian. Even by late Paleolithic times, however, ungulates provided up to 90 percent of the meat at some sites (Flannery 1969:77). The impermanent occupation of camps and caves at this time suggest low population densities (Mellaart 1975:27).

Attention should be drawn to the Natufian cultures of the Levant (ca. 10,000 to 8000 B.C.). It appears full-grown with no traceable roots in the preceding, and in some regions

contemporaneous, epi-Paleolithic Kebaran cultures (Garrod 1957:212). Though there is no evidence of domesticated plants or animals, there is ample evidence in the form of microlith sickles, querns, mortars, pounders, and pestles to suggest the processing of cereal foods (eq. wild wheat and barley). Clay lined storage pits are also evident. The Natufian have been variously described as Mesolithic (Garrod 1957), incipient agricultural (Chard 1975), and epi-Paleolithic (Mellaart 1975).

Natufian sites mark a shift in occupation to the upland regions of southwest Syria, Lebanon, and Palestine. This move was to areas of higher rainfall where wild cereals grew. Most sites are within forty miles of the sea and exhibit regional and chronological differences. The contribution from various food sources varies from site to site. Animal remains indicate gazelle was the most abundant game (Garrod 1957), though deer, wild cattle, goats, hyena, small game, and aquatic resources were also hunted and collected (Mellaart 1975:31). At some sites, like Ain Mallaha near Lake Huleh, fish hooks, gorges, and net weights are found. Garrod (1957:217) comments that enough has been found from various sites to indicate "that fishing was of some importance to the Natufian larder". The Ain Mallaha site provides early evidence of permanent settlement (Perrot 1977:611).

A notable post-Natufian site is Tell Mureybet on the Euphrates River (northern Syria). The lowest level was occupied by hunter-fishermen (ca. 8500 B.C.). There is some evidence to

suggest stability in settlement (Mellaart 1975:44; Wenke 1980:287-8). The broad spectrum subsistence base included fish, fowl, shellfish, nuts and roots (Chard 1975:209). There are also remains of wild barley. Like the wild einkorn that appears in the Mureybet II level, it is not native to the area, suggesting it was grown outside its natural habitat (Mellaart 1975:46). The Mureybet II phase provides early evidence of village settlement.

In a parallel development, there was a trend towards the domestication of animals in the Zagros area. Though roughly contemporaneous with the Natufian and post-Natufian cultural developments, there are differences in the subsistence-settlement patterns and the resources utilized (Redman 1977:534; Perrot 1977:611). The exploitation of herds of wild goats and sheep demanded greater movement. By 8000 B.C. settlement patterns consisted of summer camps on the Iranian plateau and winter settlements in the piedmont. At Ain Mallaha (Palestine), there was permanent settlement by 10,000 B.C. (Perrot 1977). Redman (1977:537) suggests this earlier development may be due to the greater reliance on plant and aquatic resources in the Levant.

The Upper Paleolithic Baradostian was followed by the Zarzian cultures. These are roughly equivalent to the Kebaran of the Levant, but are lesser known (Redman 1977:535). The post-Natufian Bus Mordeh phase at Ali Kosh is particularly relevant here (ca. 7900 - 6500 B.C.). The site was probably seasonally occupied, but shows evidence of domesticated emmer wheat and barley. These are not native to the area. Domestic

sheep and wild goats were herded. Wild game such as gazelle, onager, and aurochs were hunted. Wild plant foods like einkorn wheat, alfalfa, and rye, and aquatic resources from rivers and marshes such as carp, catfish, turtles, and mussels were also exploited (Mellaart 1975:74-5; Hole et al 1969). G. Clark (1971:86) notes that it may be significant that aquatic resources were exploited in close proximity to where cereal crops were cultivated.

The succeeding Ali Kosh phase (ca. 6500 - 6000 B.C.) was most likely a year-round sedentary village. Cereal crops had become more important. Though there was an increase in the hunting of gazelle, onagers, and wild cows, domestic goats and sheep are common. Aquatic resources figured prominently. Hole et al (1969:18) comment that fish, crabs, mussels, and turtles were important to the first settlers.

Unlike the food crops cultivated in Southwest Asia, some of the first in the New World were technologically useful plants like bottle gourds and cotton. In Mesoamerica, cultivation began before about 7000 years ago, but even after 2000 years it contributed only about 20 percent to the diet, and only after 3000 years were there village settlements (Pickersgill and Heiser 1977:825; Reed 1977:891-3). The first attempts at agriculture appear to merely "increase the efficiency of the existing pattern of broad spectrum hunting and collecting" (Bray 1976:90).

The Mesoamerican material is confusing in that there is a great deal of debate over where the first cultigens originated.

Reed (1977:928) notes that such sites as Tehuacan and Tamaulipas in Mexico, are well-known "not necessarily because those areas were centers of cultural evolution", but because of excellent preservation that yielded a "wealth of specimens". The origin of some domesticates is unknown. For our purposes it should be noted that freshwater fishing was not a significant resource in the Tehuacan valley. This is probably true of much of highland Mesoamerica.

There is some archaeological evidence to suggest that the earliest Mesoamerican villages or towns occurred in lowland tropical zones. Hammond (1977), for example, describes the early Mayan ceremonial site of Cuello in northern Belize that dates to about 4,000 years ago. This evidence pre-dates that from the Tehuacan Valley in Mexico.

In South America the problem of identifying the origin of the first cultigens persists. As noted earlier, the coastal areas of Peru and Ecuador were early centers of sedentism and agriculture, but probably not of domestication (Pickersgill and Heizer 1977:825). That the first cultigens were the bottle gourd, squashes, and common beans in both Peru and Mesoamerica suggests there may be a common origin. Subsequent exchanges between these areas may have included maize from Mexico, by around 3000 B.C., and flour corn, sweet corn, peanuts, and tobacco from South America, after about 500 B.C. (Pickersgill and Heizer 1977:826). A common view is that the central highlands of Peru are probably an independent center of agricultural innovation (Reed 1977:935).

The coastal regions were evidently influenced from this area. The contribution from aquatic resources from this region is unclear. Like the settlement patterns in Mesoamerica at this time there seems to have been seasonal movement between a number of microenvironments, some of which could have included fishing and shellfishing (cf. MacNeish 1977).

Early identified cultigens from highland Peru (e.g. common beans and the sweet potato) have as their natural habitat the humid foothills of the eastern Andes. This evidence suggests a shift of domesticated plants from the humid tropics to higher and/or drier environments. The Peruvian evidence thus serves as the best indicator of an earlier agricultural development (Reed 1977:884).

The problems of understanding the agricultural prehistory of highland and coastal Peru and Mesoamerica make Lathrap's (1970, 1977) proposition of an earlier development in the lowland tropical forests less easily dismissed. Though setting aside the issue of what role the bottle gourd played, it does not seem unreasonable to suggest that the cultivation of root crops occurred in a tropical riverine complex, and the diffusion of the crops and the appropriate social relations, followed such rivers. As Pickersgill and Heiser (1977:827) note, there is as yet no archaeobotanical evidence to refute Lathrap's view. Reed (1977) considers at length Lathrap's proposition, noting that until further research is conducted, it must remain as a viable theoretical alternative.

The preceding discussion has been a geographically selective sampling of the sites and cultures relevant to the question of agricultural origins. Though I cannot successfully demonstrate the presence of true fishing cultures in the early centers, there is no denying the role of some form of aquatic exploitation. This discussion has been decidedly brief, and cannot do full justice to the volume of archaeological data available on this subject. Nevertheless, it indicates a viable avenue of research.

In most areas of agricultural origins there is every reason to believe future research will further document the important role of aquatic resources. As Binford (1968:334-5) notes, the evidence for such resource exploitation by the Natufian of the Levant suggests an area (or ecological niche) where incipient agriculture may yet be discovered. Greater challenges rest in the area of tropical forest archaeology. There is proving to be enough indirect evidence to suggest that root crop cultivation may have very ancient origins. That this occurred in the context of a riverine exploitation seems very likely. Research in the tropical zones of Southeast Asia and Central and South America will probably bear this out. The task is to discover the locales of early domestication and of early agricultural systems. Caution must be exercised in attributing sites of good preservation as sites of early domestication. The differences in the developmental sequences from Southwest Asia and the New World may be more apparent than real, in that they may reflect the distinction between evidence that is recovered, and actual events.

in the zones of domestication.

Many questions remain unanswered. There are significant gaps in our archaeological knowledge of early agriculture and of what kind of data constitutes evidence for fishing societies. As well, there are major shortcomings in our knowledge of cultural processes. The rate with which subsistence innovations are developed, adapted, and diffused must be explored further. Given the state of our knowledge, a viable working hypothesis is that fishing societies, rather than terrestrial foragers, occupied ecological zones suitable for the process of domestication and the development of agricultural systems. Once agriculture was established, and the potential of the new ecological relations were recognized, the techniques and/or the cultigens may have spread rapidly beyond the areas of its development. It would appear from the available literature that much of the archaeological evidence we have of the first cultigens document this later phase of diffusion.

The following chapter explores the cultural characteristics of fishers. It is hoped the exercise will help us to better understand the nature and logic of these societies, and the problems of transition from food gathering to food production.

CHAPTER FOUR

The Cultural and Evolutionary
Significance of Fishing Societies.

This chapter will focus on the ethnographic data of fishing societies. It has been argued so far that fishing is a specialized foraging activity which may, in suitable environments, afford higher levels of productivity and a concomitant greater degree of social complexity than that of terrestrial foragers. In the context of agricultural origins, a freshwater fishing strategy could more readily invoke the appropriate social and environmental relations necessary for the development and adoption of an agricultural system. It is not the fishing activity 'per se' that promoted agriculture but the social and ecological context within which it takes place. The archaeological evidence also suggests this role for fishing just prior to the development of food production. It will be shown here, that in terms of the theoretical differences between foraging and farming developed in CHAPTER TWO, fishing societies tend to be more complex than terrestrial foragers. It is from an inquiry into social relations and the levels of social complexity, and the conditions by which they may evolve, that social evolution must be viewed.

It will become apparent that the topic of fishing encompasses

a broad range of issues and concerns. The effort here will be to present a cross-cultural survey of societies that place a primary subsistence effort upon freshwater fishing activities. To do so first requires that certain parameters and justifications be made. This is best approached under a number of subheadings. They will be presented as follows: (1) a definition of fishing, (2) the attributes of a fishing environment, (3) the evolutionary significance of fishing, (4) the evidence of existing cross-cultural surveys, and finally, (5) the survey to be presented here.

• A DEFINITION OF FISHING.

It is important to understand what the term 'fishing' will mean here since a diverse range of activities can come under its heading. Our interest is in those societies where the subsistence contribution from aquatic resources exceeds any other source. Though maritime societies will be discussed below, they will not be included in the survey. It is assumed that the evolution of agriculture occurred within a freshwater context (cf. Sauer 1952; Lathrap 1977). This notion was explored more fully in CHAPTER THREE. Societies that maintain any dependence upon agriculture will be excluded from analysis. Our interest is in the incipient forms of social complexity, thus logically, those who practice some farming should be considered separate from those who do not.

The techniques of fishing and foraging essentially are alike

in the relationships they invoke between man and his exploitive environment. Fishing is understood as a mode of exploitation where water is the subject of labour (Marx 1976:284). This is a technical definition that refers to the forces of production. It can include a wide range of possible resources and techniques ranging from the exploitation of fish and sea mammals to the collection of shellfish and aquatic flora [20]. Techniques can include the use of nets, poisons, spears, fixed traps, and hooks. The common habitat of the quarry and the use of technical devices that are often not used in any terrestrial context warrants the rubric 'fishing' above all these activities (Hewes 1948). They remain, nonetheless, a specialized foraging technique.

Such an environmental/ecological classification (cf. Faris 1975:242) is at best an artificial one. With respect to the techniques of sea mammal hunting and the collecting of fixed aquatic resources, this definition is less precise. Like hunting, fishing has never provided control over the resources or commodity, and though the technology and organization of the harvest may change, it will remain hunting in nature (Leap 1977:257-8). This is a characteristic of a subsistence mode of exploitation involving the environment as a subject of labour.

Lenski and Lenski (1982:219-20) argue that not only does the unique context of fishing warrant its broad rubric, but because fishing economies have the potential for supporting a larger and more sedentary population than foragers, there is more reason to consider them as a separate societal type [21]. In part, the

settlement patterns relate to the different reproductive capacities of aquatic resources. Fish have much higher reproductive rates and their movements in and out of a community's territory usually prevents the long-term depletion of an immediate area. These conditions are not readily paralleled in a terrestrial context (cf. Hewes 1948:243).

Another criterion by which fishing has been distinguished from comparable terrestrial activities is in the risk of the activity. In the context of fishing from boats on the ocean, some researchers have noted that this particular environment, with the technologies involved, tend to regularly present greater dangers and uncertainties than most terrestrial food procurement systems (Norr, Norr 1978:163-4; Smith 1977:7-8). This uncertainty may be reflected in the greater tendency of fishing peoples to have beliefs in a God or Supreme Creator who is active and supportive of human morality (cf. Lenski, Lenski 1982:96, Table 4.4). Such beliefs, however, cannot be considered a general characteristic of fishing. It would be expected only if the procurement techniques were difficult and dangerous, and more so, if production was also geared for commodity exchange. The uncertainty of the market could only compound the sense of risk involved with the techniques. It is mostly in a maritime context that such dangers would be expected.

THE ATTRIBUTES OF A FISHING ENVIRONMENT.

We can list then, a number of conditions or attributes that are characteristic of a fishing environment [22]. Relative to the terrestrial foraging context, they provide the potential for greater productivity and more stable populations. From this we can predict more complex social forms. The list also suggests certain ecological relations can develop that are more compatible to those of farming. Such conditions are less likely to occur in a hunting or gathering context.

1. In both riverine and maritime environments, settlement patterns tend to be elongated; shorelines are more readily divided into segments for ownership or administration (Hewes 1948:240). Water, as the context of exploitation, offers greater uniformity than terrestrial zones of similar extent. Yet, shorelines also may unify differing terrestrial environments.

2. There is never exclusive reliance on fishing; the activity can only broaden the subsistence potential. Those who fish also must be familiar with the exploitation of terrestrial resources (Smith 1977:7; Leap 1977:253).

3. Fishing sites are often stable and regular in their yield. Though this may be recurrent or seasonal, they are reliable and, through time, may outlast the yields of other natural or cultivated resources (Hewes 1948:241-2). Economic activities are often concentrated at fixed locations.

4. The time of migration of certain fish is predictable and can thus be anticipated. Though this situation is not unusual in a terrestrial context (eg. caribou), fishing provides a very high return on labour, even with the simplest of technologies (Hewes 1948:243). Fishing implements can also be the most complex of all subsistence technologies (cf. Oswalt 1976).

5. "Measured by the caloric effort required to obtain them, aquatic foods, as a whole, have an exceptionally high degree of nutritional efficiency" (Hewes 1948:244). Fish, shellfish, crustaceans, etc., are a quality food source.

6. Aquatic resources normally cannot be seen nor can their movements or rates of reproduction be manipulated. Emically, this provides a sense of uncertainty. On the other hand, such a lack of control may also ensure a continual return on resources at any given site. Fish are not bounded by the territories set by man. Men, however, do socially control access to those resources that pass through recognized territories [23].

The above attributes are general and are not expected to occur in all circumstances. On the whole, however, they suggest that a reliable and stable ecological relationship is not uncommon in societies that emphasize fishing resources. It remains to be seen if these environmental attributes have any significant influence on such specialized foraging societies as

freshwater fishers. In terms of social evolution, a significant difference between the social characteristics of fishers and foragers, may have had far-reaching consequences.

THE EVOLUTIONARY SIGNIFICANCE OF FISHING.

It will be shown below that fishing is a widely practiced activity and is, in fact, a more significant specialized non-agricultural activity than hunting. Given this, it is curious that discussions in evolutionary economics have largely left fishing unaddressed. At best, it is simply considered a pre-agricultural alternative (Leap 1977:252) [24].

The evolutionary significance of fishing lies in its relative contribution to the total subsistence effort. But this in itself cannot be a true measure of the potential fishing may hold for social complexity. The environment must obviously play a deciding factor. For example, the Attawapiskat, a Cree-Montagnais people of Northern Ontario, rely on fishing for 56-65 percent of their diet. They are a semi-nomadic population with communities ranging in size from 50 to 100 people. The bands are autonomous and informally organized. In many respects they typify what has been termed a primitive communist society (see note #15). In comparison, the Kwakiutl of British Columbia rely less on fishing (i.e., 46-55 percent of their diet), yet their systems of production, distribution, and consumption reach levels that far exceed those normally expected from their forces of production (Murdock 1967:102). Similarly, the Calusa of Florida's southwest

coast provide another example of a complex maritime society. Ethnohistoric evidence suggest they once maintained dense, sedentary, and socially stratified populations with no reliance on agriculture (Gongin and Sturtevant 1964). These two societies serve as examples of what might be called the "environmental liberation" of the productive forces. They do not typify the more limited productive standards common to most foraging societies.

The high productive potential of maritime societies deserves special attention. To include such societies in our survey would enable us to readily demonstrate the greater social complexity of fishing societies. This is what is indicated by existing cross-cultural surveys. Those noted below, for example, include data on both freshwater and maritime cultures. Some of the latter societies are geared towards simple commodity production and this has led a few researchers to argue that, in the spheres of management and the processing of the commodity, they are comparable to peasant farmers (cf. Faris 1977; Leap 1977). At a technical level the procurement techniques are the same as with all fishing peoples. The levels of production, however, in the modern context, detract from our interest in the origins of complex forms. Therefore, there are a number of reasons for excluding maritime communities from our sample. The first is the assumption made earlier, that agriculture developed within a freshwater context (see CHAPTER THREE). The second relates to the social complexity already recognized in maritime societies. Given this knowledge, it would be useful to refine our understanding by

exploring the implication of fishing in non-maritime conditions. Finally, even if we chose to exclude only those societies that engage in commodity production, we are still left with no criteria within the coded cross-cultural data by which to distinguish these conditions. It is easier to eliminate the whole maritime category.

THE EVIDENCE FROM EXISTING CROSS-CULTURAL SURVEYS.

It would be useful at this point to examine what other surveys have revealed about fishing. Although these studies tend to support the hypothesis that fishing societies are more complex than terrestrial foragers, they do not distinguish between a maritime and freshwater context. This, in itself, warrants the study presented here. A common source for coded data is Murdock's ETHNOGRAPHIC ATLAS. Though the criteria for selecting a sample varies, there is a clear indication of the significance of fishing as a subsistence activity. The surveys of Lee (1968), Leap (1977), and Ember (1978) for example, compare the relative contribution of hunting, fishing, and gathering activities. All are drawn from Murdock (1967). The studies are summarized below, in TABLE 1.

The data in TABLE 1 show fishing as an important activity. Ember ranks fishing as the most important activity, while Lee and Leap rank it second, after gathering. The cross-cultural data

TABLE 1.

Summary of three cross-cultural studies that compare the relative importance of gathering, fishing, and hunting within hunter-gatherer-type societies (modified from Ember 1978:Table 3; Leap 1977:254; Lee 1968:Table 9, 10).

SUBSISTENCE STRATEGIES.	Lee	Leap (a)	Ember
1. Gathering is dominant.	50%	43%	30%
2. Fishing is dominant.	31%	21%	38%
3. Hunting is dominant.	19%	5%	25%
4. Gathering, fishing, and/or hunting co-dominate.	--	22%	4%
5. Hunting and fishing co-dominate.	--	9%	2%
NUMBER OF SOCIETIES IN EACH SURVEY.	58	58	180

(a). Leap's study is a reworking of the data used by Lee.

also indicate that a subsistence contribution from fishing is common to most pre-agricultural societies. Leap (1977:254) provides a figure of 79 percent for the societies in his survey. Lenski and Lenski, in a study of 151 hunter-gatherer societies, found that 80 percent rely on fishing to some extent. A review of all the societies listed within the ETHNOGRAPHIC ATLAS shows that close to 70 percent (600/862 cases) practice fishing to some degree. Given this evidence, it is curious that fishing has remained largely unaddressed in terms of social evolution [25].

Though all three studies summarized in TABLE 1 are drawn from the same universe, there is little agreement as to the degree of dominance of any one strategy. Differences in the definition of subsistence categories, and differences in the criteria for selecting cases for a sample, favour such discrepancies. Ember (1978:441) provides a discussion of the implications of these differences with respect to her study and that of Lee (1968). Such differences reduce the viability of comparing the results of different cross-cultural surveys. The studies summarized above, for example, reveal little more than that fishing is more important than hunting and may, depending on definitions, rival gathering in importance.

Originally, I had hoped the results from the more extensive surveys by Lenski and Lenski (1982), and Textor (1967) would provide general cross-cultural statements on foraging, fishing, and simple farming societies. A summary of these surveys is presented in TABLE 2 and TABLE 3, respectively.

TABLE 2.
Comparative cross-cultural data for three different
subsistence strategies (modified from Lenski and Lenski
1982:91, 93-4, 115, 119, 123, 220, 458, 462, 470).

CHARACTERISTICS	Fishing	Hunting Gathering	Simple Farming
1. Average size of the community.	60 people	40 people	95 people
2. Permanent settlements.	49%	10%	87%
3. Marriage and kinship:			
a/ Monogamy.	--	12%	--
b/ Marriage as an economic exchange.	77%	48-49%	61%
4. Social inequality:			
a/ Hereditary nobility.	32%	2%	--
b/ Slavery.	over 50%	10%	--
5. Craft specialization:			
a/ Leather working.	0	0	3%
b/ Pottery.	0	0	2%
6. Political systems:			
a/ 2 or more communities.	23%	10% (a)	21-23%
b/ Office of headman absent.	--	12%	--
c/ Hereditary transmission of office.	--	54%	--
NUMBER OF SOCIETIES IN EACH CATEGORY.	44 (b)	151	76

(a). In hunter-gatherer societies where fishing is not important, this figure is reduced to only 2 percent.

(b). This category includes both maritime and freshwater fishers.

TABLE 3.
Cross-cultural data from Textor (1967): paragraphs #69
(fishing), #68 (hunting), and #70 (collecting).

CHARACTERISTICS (a)	Fishing (b)	Hunting and Collecting (c)
1. Community size, less than 200.	90%	100%
2. Nomadic or non-fixed settlements.	36%	76%
3. Class stratification:		
a/ Present.	--	11%
b/ Based on wealth.	63%	--
c/ Slavery.	--	12%
4. Craft specialization:		
a/ Metal working.	6%	2%
b/ Weaving.	29%	24%
c/ Pottery.	28%	37%
5. Political systems:		
a/ Jurisdictional Hier- archy of 1-4 levels.	35%	13%
b/ Family or autonomous community.	91%	90%
c/ Hereditary succession of headman.	--	28%
6. Inheritance of real property.	45%	19%
NUMBER OF SOCIETIES IN EACH CATEGORY.	44	47

(a). The coding for the data presented here are all from Murdock (1967) except item 5b, which is from Murdock (1957).

(b). This category includes both maritime and freshwater fishers.

(c). This column summarizes the data from two different paragraphs. Textor considers hunting cultures separate from collecting cultures.

The characteristics in TABLE 2 and 3 were selected to approximate some measure of social complexity. Given the differing characteristics for foragers and farmers noted in the previous chapter, the surveys by Lenski and Lenski, and Textor, were reviewed in search of relevant statements. The effort was to find evidence concerning (1) the number of labourers and volume of surplus-production, (2) the degree of sedentism, (3) the degree of kinship emphasis, (4) the degree of craft specialization, (5) the extent of commodity exchange, and (6) the presence of ceremonial activities that are independent of immediate production. There are only a few statements that apply specifically to our interests, thus the above characteristics must often be assessed indirectly with what statements are available. I had intended to use these data as a base of comparison for what I had collected on freshwater fishing cultures. That proved, however, to be unsuitable for a number of reasons which I will discuss below. In the end, it was necessary to draw my own survey of foragers in order to develop meaningful statements about freshwater fishers.

The surveys summarized in TABLES 1, 2, and 3 are presented here to highlight the differences that can arise between studies that are drawn from the same quasi-universe as the ETHNOGRAPHIC ATLAS. They also provide insight into what is known about the broad freshwater-maritime category of fishing. Again, these studies indicate it is an important activity, but the anomalies between them suggest a more refined inquiry is in order.

The data in TABLE 2 and TABLE 3 support the general understanding that fishing societies tend towards a higher degree of social complexity than do other foraging strategies. Community sizes are larger than foragers (or tend to be so), and more permanent or fixed. Also, class stratification and slavery, which suggest production geared towards surplus accumulation, occur more frequently among fishers. But, these conclusions are developed with there being little agreement, or confirmation, in the results between surveys.

These two studies group maritime and freshwater fishers together. Any measure of greater complexity is therefore not all that surprising, given what was noted in the previous section about such maritime societies as the Kwakiutl and the Calusa. The gaps in what data are available from the two studies make any comparison between subsistence types difficult for certain cultural characteristics. Where there are points of comparison, the measured frequencies are often not in agreement. Such gaps and differences make it difficult to establish valid statements on the frequency of given cultural traits that are of any use in comparison with statements about freshwater fishers.

The following is a list of some of the problems and methodological choices inherent in a cross-cultural study of this nature. The list will include reference to the studies summarized in TABLES 1, 2, and 3. This discussion will make apparent why it was necessary to conduct our own cross-cultural study. It also outlines why certain methodological choices were made in

conducting the study. I will not attempt to explore fully the problems of the cross-cultural method. For a discussion of such problems see R. Naroll (1970a,b,c).

1. As noted earlier, a prime reason for conducting our own survey is in the difficulty of finding statements from existing studies that provide information about our concerns. As it stands, the use of the ETHNOGRAPHIC ATLAS demands that research questions be posed in terms of the cultural characteristics listed in the summary. It is too restricting to rely on the limited selection of statements provided in previous studies. Using more than one study introduces the problem of validating any comparisons between them. Opportunism must prevail in finding statements from other studies that are relevant to our concerns here. It is better to exercise as much choice as possible by using the original characteristics listed in the ETHNOGRAPHIC ATLAS.

2. With existing studies, there has been a lack of precision as to what is encompassed under any given subsistence category. For example, Lenski (1970:503-7) lists 44 societies as fishing, of which 25 percent have some contribution from farming (see TABLE 2). Similarly, 36 percent of the 44 fishing societies listed by Textor (1967:paragraph #69) practice farming, some with a dependence equal to that of fishing (TABLE 3). Since our research interests are in pre-agrarian

societies, these studies are less useful. Our concern is with those that have no subsistence contribution from animal husbandry or farming.

3. The ETHNOGRAPHIC ATLAS (1967:46) provides a definition of fishing activities that is similar to the one presented above. This makes matters easy. Lee (1968:41), however, redefined the subsistence categories so that hunting included the taking of sea mammals, and gathering included shellfish collecting. This definition requires reference to the original ethnographic material from which the coding was based. The differences between the studies of Lee (1968) and Leap (1977) and that of Ember (1978) can be understood, in part, by this recoding (see TABLE 1). Ember, Textor (1967), and Lenski and Lenski (1982) all maintain Murdock's original subsistence categories, as does the study presented here.

4. Specific to our interests is an inquiry into the nature of freshwater fishing societies. None of the studies noted above control for this subsistence characteristic. The ETHNOGRAPHIC ATLAS does not list data on this trait beyond providing the geographical location of each society. Locating a society on a map, and if necessary, consulting the source material allows one to assess the suitability of any society for selection.

5. If striving for a representative world sample, it is

important to measure functional associations and not those of diffusion. The criteria by which cases are selected must attempt to assure the relative independence of each. This is referred to as 'Galton's problem' and is considered widely to be a crucial weakness of the cross-cultural method (Naroll 1970b:974). There are a number of solutions to this problem. The one adopted here is suggested in the ETHNOGRAPHIC ATLAS (1967:5). This is essentially a geographically controlled comparison whereby a society is selected randomly to represent a cluster of related societies. There are 412 clusters listed in the ETHNOGRAPHIC ATLAS. Each is represented only if it includes societies relevant to the research interests (i.e., collecting, hunting, and/or freshwater fishing societies). Not all studies control for geographical and cultural associations and thus certain regions may be overrepresented within a survey. The studies by Ember, Textor, and Lenski and Lenski do not control for the relative independence of cases (cf. Pelto and Pelto 1978:226-7) and attempt only to provide comparisons of all societies for which coded data is available. The advantage to such a strategy is an increase in sample size. Compare, for example, the survey totals in TABLE 1; unlike Ember, Lee and Leap do control for the geographical representation of cases; as such, their samples are smaller (58 cases each compared to the 180 in Ember's survey). The survey presented here also has a relatively small sample size.

6. A related problem is the statistical validity of the samples. Though within certain guidelines, the selection of societies may be considered random, the total available for selection are not representative of the universe of societies. Listings within the ETHNOGRAPHIC ATLAS represent only those cultures for which sufficient data has been amassed. They are therefore "opportunistic samples" (Pelto and Pelto 1978:265) and, as noted, provide uneven geographical and cultural representation. Also, no quotas are set on the number of cases representing any one cluster or region (Naroll 1970a:906). This can further foster the effect of diffusion if geographical representation has not been controlled for. The justification for using any statistical test on imperfect samples is that "...it is useful to do the best one can with available resources" (Pelto and Pelto 1978:151). One must exercise caution in utilizing certain statistical tests, as well as care in the conclusions that can be drawn from them.

A CROSS-CULTURAL SURVEY OF FRESHWATER FISHING SOCIETIES.

In APPENDIX THREE, a discussion is presented of the procedures by which cases were selected from the ETHNOGRAPHIC ATLAS for inclusion in our survey. Those surveyed as freshwater fishing societies are listed in APPENDIX ONE; those considered as foragers are listed in APPENDIX TWO. The main aim of this survey is to assess the social characteristics of freshwater fishing societies in light of the theoretically perceived characteristics

of farming production developed in CHAPTER TWO. The characteristics of fishing societies will be compared with those of foragers in order to demonstrate the greater social complexity of fishers.

In terms of the theoretical conclusions drawn, the cross-cultural data available in the ETHNOGRAPHIC ATLAS can be of limited value in assessing their ethnographic validity. The cultural characteristics available and the degree of differentiation within any one column can be restrictive. In many cases our theoretical conclusions can only be indirectly assessed by these data. For example, the level of commodity exchange within a culture is not something that is specifically coded within the ETHNOGRAPHIC ATLAS. From our theoretical analysis it was concluded that the level was higher among farmers than among foragers. That this may be also true of fishers (though to a lesser degree) must be tested indirectly with the cross-cultural data by (1) measuring the frequency of marriages involving economic transactions, (2) measuring the occurrence of craft specialization, and/or (3) by measuring the frequency of private ownership and inheritance of movable and real property. This thesis would suggest these characteristics would be more common to fishing than foraging societies (see TABLES 6, 9, 10, and 11).

Another conclusion presented in the previous chapter is that farming cultures, more so than foragers, tend to practice ceremonial activities that are independent of immediate production. Again, we would expect fishers to also show a

greater tendency than foragers, but in this case we have no coded data to assess the ethnographic frequency of this trait. The only category within the ETHNOGRAPHIC ATLAS that approaches this concern is column #34 - High Gods. It deals with the presence or absence of the belief in certain spiritual beings and is of little use here.

The cases of freshwater fishers selected all have the characteristic of being located at relatively high latitudes. This is problematical in that the proposed centers for early domestication and farming occur well below 45 degrees latitude. It would have been beneficial to have surveyed societies located in more tropical regions. We would expect that with higher latitudes the potential gains of a successful fishing season may be balanced out by the lower productivity of other activities during the rest of the year. The overall annual surplus-production may not exceed basic subsistence needs. This is not to suggest that the level of surplus production is solely dictated by the environment, since it is known that underproduction is a culturally practiced dimension of non-agricultural economies. Nonetheless, we would expect that in societies located at lower latitudes a benign environment would favour a more constant level of surplus-production. We could hypothesize a concomitant tendency towards more complex social formations.

The general underrepresentation of pure low latitude fishers in the ETHNOGRAPHIC ATLAS may reflect the lack of suitable data

on these societies, or the opportunistic selection criteria employed in compiling its quasi-universe [26]. Lee (1968:42-3) notes that fishing tends to be the dominant activity in the cool to cold temperate zones, between 40 and 59 degrees latitude. It is a widespread activity, however, occurring with varying emphasis in close to 70 percent (600/862 cases) of the societies listed in the ETHNOGRAPHIC ATLAS.

The high latitude bias in our sample is also exacerbated by the control against maritime societies. This is indicated by Textor's data set (1967): in a mixed sample of fishing cultures, 52 percent are located above 40 degrees latitude. However, in our sample of freshwater fishers 94 percent are located above this parallel (see APPENDIX ONE). As such, it is important to know whether we have correlations based on subsistence strategies or factors related to latitude.

It was thus in an effort to control for latitude that each sample was divided into two sub-samples according to (1) those located at, or above, 45 degrees latitude, and (2) those located below this latitude. Notwithstanding the unequal distribution of cases (28 percent of fishers, and 78 percent of foragers are located below 45 degrees), there are a number of positive results which appear independent of latitude (eg. TABLE 4 and TABLE 5).

The distribution of traits among fishers and foragers are summarized in the following tables. The column number noted for each table refers to the source of coded data in the ETHNOGRAPHIC ATLAS (1967). At the first level of abstraction, the differences

are presented as a percentage of cases that have a positive correlation with the trait in question. The differences between high and low latitude sub-groups are also presented. In addition, each table lists the number of positive correlations among those cases which have codes for the traits in question (see 'n').

At the second level of abstraction, the covariation between a trait and subsistence is expressed in terms of a coefficient of association. I have chosen Yule's Q because of the simplicity of its application. The essentially opportunistic sample for our data base does not warrant statistical tests of independence. It is not really a random sample. Besides, such probability statements tell nothing of the magnitude of the relationship in question. We are thus better informed with a measure of association (Pelto and Pelto 1978:162). Driver (1961:321) notes, however, that "a chance relationship will always yield a Q of zero", thus we do have some indicator of whether a measured frequency is the result of random distribution [27].

TABLE 4.

The presence of sedentary or semi-sedentary settlement patterns (column 30).

	Total for all cases (n).	Cases located below 45 deg. latitude (n).	Cases located above 45 deg. latitude (n).
Fishers	33% (6/18)	20% (1/5)	38% (5/13)
Foragers	8% (3/36)	7% (2/28)	13% (1/8)
Q	.69	.53	.63

These data present a strong positive association in support of the hypothesis that fishers, more so than foragers, tend toward more permanent settlements. The percentages suggest the trait is not especially significant to either subsistence strategy. The frequency of permanent settlement among freshwater fishers, however, is less than that noted by Lenski and Lenski (TABLE 2). This may be the result of differences in the definition and selection of samples.

TABLE 5.

The presence of local communities of mean size greater than 50 persons (column 31).

	Total for all cases (n).	Cases located below 45 deg. latitude (n).	Cases located above 45 deg. latitude (n).
Fishers	73% (8/11)	67% (2/3)	75% (6/8)
Foragers	20% (5/25)	16% (3/19)	33% (2/6)
Q	.83	.83	.71

TABLE 5 provides a strong correlation for fishing and larger communities. This is true independent of latitude. The data from TABLE 2 and TABLE 3 also support this proposition. Given the magnitude of the relationship, this is an important difference.

TABLE 6.

The presence of a mode of marriage involving economic transactions (column 12).

	Total for all cases (n).	Cases located below 45 deg. latitude (n).	Cases located above 45 deg. latitude (n).
Fishers	33% (6/18)	40% (2/5)	31% (4/13)
Foragers	50% (18/36)	43% (12/28)	75% (6/8)
Q	-.33	-.06	-.74

The data from TABLE 6 is curious in that it provides a moderate negative correlation against our hypothesized relationship; the association is weak below 45 degrees, but strongly negative above. It suggests high latitude foragers, for some reason, practice bride-price, bride-wealth, and/or bride-service, proportionately more so than fishers. From the figures provided by Lenski and Lenski (TABLE 2), we would have expected the relationship to be positive. That it is positive in TABLE 2 may be because that survey included maritime fishing societies.

TABLE 7.
The presence of class stratification (column 67).

	Total for all cases (n).	Cases located below 45 deg. latitude (n).	Cases located above 45 deg. latitude (n).
Fishers	56% (10/18)	60% (3/5)	54% (7/13)
Foragers	22% (8/36)	25% (7/28)	13% (1/8)
Q	.63	.64	.78

Class stratification does vary according to the subsistence base. This relationship is very strong above 45 degrees latitude (by a high proportion). Stratification is defined here as distinctions based on hereditary social classes and/or in terms of wealth (the possession or distribution of property).

TABLE 8.
The presence of slavery (column 71).

	Total for all cases (n).	Cases located below 45 deg. latitude (n).	Cases located above 45 deg. latitude (n).
Fishers	50% (9/17)	60% (3/5)	46% (6/13)
Foragers	16% (5/36)	11% (3/28)	25% (2/8)
Q	.72	.85	.44

There is a strong association between the occurrence of slavery and fishing; especially below 45 degrees latitude. The relationship is moderate above this latitude though

proportionately, almost twice as frequent as foragers. It would seem that among fishers the prevalence of slavery is about equal to that of class stratification. The data, however, do not show whether the cases that have a positive correlation for one trait also offers a positive correlation for the other. It would be interesting to discover the degree to which these traits occur simultaneously within any one society.

TABLE 9.
The presence of weaving (column 44).

	Total for all cases (n).	Cases located below 45 deg. latitude (n).	Cases located above 45 deg. latitude (n).
Fishers	12% (2/17)	20% (1/5)	8% (1/12)
Foragers	9% (3/34)	4% (1/27)	25% (2/7)
Q.	.16	.73	-.63

The correlation between fishing and weaving seems very weak. This table is presented to illustrate an anomaly; below 45 degrees latitude the association is positive and strong, yet it is the exact opposite above 45 degrees. The proportions, however, are small and indicate the trait is not particularly important to either subsistence strategy. Such low numbers help explain the disparate measures obtained for Q. The results are curious in that one would anticipate that net technology among fishers would be important and perhaps associated in some way.

with weaving. The ETHNOGRAPHIC ATLAS, however, provides no data for such traits as the manufacture of nets, baskets, or mats.

TABLE 10.
The presence of leather working (column 46).

	Total for all cases (n).	Cases located below 45 deg. latitude (n).	Cases located above 45 deg. latitude (n).
Fishers	94% (16/17)	80% (4/5)	100% (12/12)
Foragers	66% (19/29)	64% (14/22)	71% (5/7)
Q	.79	.39	1.0

Leather working appears as an important trait for both fishers and foragers, though proportionately more so for fishers. There is only a moderate measure of association below 45 degrees, otherwise it measures, on the whole, as strong. One problem with this table is that all our fishers above 45 degrees practice leather working. This probably does not reflect ethnographic reality, but because of the nature of Yule's Q under these conditions (cell b of a two-by-two matrix being zero), Q measures as a perfect association. As an exercise, I modified the frequencies so that in one case of fishers, the trait is assumed absent. I then recalculated Q. The association above 45 degrees was lowered to a measure of .62, and that of the sample as a whole measured .60, thus the correlation remained strong.

TABLE 11.
The presence of pottery (column 48).

	Total for all cases (n).	Cases located below 45 deg. latitude (n).	Cases located above 45 deg. latitude (n).
Fishers	22% (4/18)	20% (1/5)	23% (3/13)
Foragers	29% (10/34)	37% (10/27)	0 (0/7)
Q	-.19	-.40	1.0

Pottery seems, in general, to be little influenced by fishing, and if at all, in a negative way. Latitude, however, may play an important role. Above 45 degrees, the relationship is strong and positive, while below this, it is moderate and negative. If we conduct the same exercise as we did in TABLE 10, and manipulate the frequencies to eliminate the zero occurrence of pottery among foragers located above 45 degrees, the level of association between fishing and pottery is reduced to .29 from the actual measure of 1.0. The negative association between all fishers and pottery is strengthened in this exercise to -.25. The figures on weaving exhibit a similar but opposite emphasis between latitudes. Only the figures on leather working provide consistent positive results.

TABLE 12.
The presence of hierarchies beyond the local
community (column 32).

	Total for all cases (n).	Cases located below 45 deg. latitude (n).	Cases located above 45 deg. latitude (n).
Fishers	11% (2/18)	0 (0/5)	15% (2/13)
Foragers	17% (6/36)	18% (5/28)	13% (1/8)
r	-.23	-1.0	.12

Even though we had a strong correlation of fishing with class stratification and slavery, our figures on intercommunity hierarchies suggest it is unimportant. Below 45 degrees the association is a perfect negative; it has a frequency among foragers, however, of only 18 percent. Such low proportions, and the generally weak associations, make any conclusions suspect. By manipulating the data in the same manner as in the previous two tables, the association between fishers and hierarchies (.07 among societies located below 45 degrees) becomes weak and positive. Fishers and foragers, as a whole, have a zero association, which suggests the recorded frequencies reflect a chance correlation. The data from existing studies offer little insight. The surveys by Lenski and Lenski and Textor, both suggest such hierarchies are more prevalent among fishers than among foragers. These contradictory results, and the low measure of association, suggest problems with the coded data.

TABLE 13.
The presence of the office of headman (column 73).

	Total for all cases (n).	Cases located below 45 deg. latitude (n).	Cases located above 45 deg. latitude (n).
Fishers	83% (15/18)	80% (4/5)	85% (11/13)
Foragers	91% (31/34)	92% (24/26)	88% (7/8)
ϕ	-.35	-.50	-.12

This table suggests the office of headman is more common to foragers than fishers, but only slightly. The trait is very common to both strategies. The association is weak and negative at high latitudes, and strong and negative at low latitudes. It is difficult to determine if this difference between fishers and foragers is real.

Though data were collected on a number of other traits, the preceding eleven tables illustrate the range of differing results, as well as the problems encountered in interpreting them. Of the traits that were omitted, some had either weak or questionable associations and/or frequencies that suggested the traits were not very important to either subsistence strategy. Others, like the presence of rules of inheritance of real or movable property, are based on suspect coding and should be viewed with circumspection (Murdock 1967:59). The results for both were moderately positive, though in each there was one empty

cell, and contradictory valences between latitude (low latitudes were negative).

Both fishers and foragers were measured for the occurrence of extended family organization. The proportion for fishers was consistently higher than that of foragers, except that above 45 degrees, the association was weak. Otherwise, it was a moderate association. The coded data for family organization offers a number of sub-characteristics ranging from forms of marriage, to residence patterns. To compress these into fewer categories for the sake of measurement does little justice to the variability at hand, and makes any results more suspect. Similarly, in keeping the original range of sub-categories of organization, the problem of having too few cases to measure adequately the diversity of forms arises. Therefore the table was omitted.

In terms of the theoretically defined characteristics of farming production (CHAPTER TWO), we can claim only moderate success in our ethnographic assessment. As noted earlier, aspects of ceremonialism can not be effectively assessed with the coded data. Neither is the important characteristic of kinship especially amenable to measurement. At best, we gain a statement of relative importance among fishers, with a weak to moderate measure of association, but this result is of questionable validity. It is not that correlation between fishers and ceremonial activities and kinship does not exist, but that it cannot be effectively measured with the data at hand.

Turning to more positive results, a greater number of

labourers and higher surplus-production can be inferred for fishing societies. Communities are larger, and there is a tendency to either class stratification and/or slavery. Sedentism occurs among both fishers and foragers, but more so among the former. Curiously, hierarchies beyond the local community are not particularly important to either, and our data show a weak negative association against fishers.

Increased levels of commodity exchange and craft specialization find only moderate support with our data. Leather working is important to both modes of production, and shows a strong positive association with fishers. Weaving is less important, with the data suggesting latitude as an influential factor. This also seems true of pottery which, in general, is moderately more important than weaving, but diametrically opposed in the latitude in which the associations are strong. It is difficult to assess their significance.

The data from TABLE 6 suggest that such traits as bride-service, bride-price, and/or bride-wealth are more frequent among foragers than among fishers. Latitude may be of some influence; foragers located above 45 degrees have a substantially higher proportion for such traits and a strong measure of association. Nonetheless, these data do not support our hypothesis.

Our efforts to control the factor of latitude has allowed us to develop more secure statements about our findings. The exercise, however, has raised a number of new questions. The

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differences in latitude for such traits as weaving and pottery, hierarchies beyond the local community, and hereditary succession, demand alternative hypotheses for explanations. At best, we have avoided making statements about fishers and foragers that were not applicable to all cases.

In the end, our final understanding of fishing societies has been in an effort to avoid biases inherent in using only a few case studies. The statements are general, and are meant to be applicable to all freshwater fishers. This chapter has provided a more definitive characterization of societies that emphasize freshwater resources. Our analysis indicates that such societies do exhibit a higher degree of sedentism and socio-economic differentiation than terrestrial foragers. These are characteristics that serve to differentiate foragers from farmers and may have been crucial to the processes of domestication and to the adoption of agricultural systems. Fishing activities are known to have grown in importance during the Pleistocene and early post-Pleistocene era, and we may speculate, that if these adaptations resemble what we know ethnographically of these societies today, they may have served as a fertile context for what proved to be significant social evolution.

CHAPTER FIVE

Conclusion.

The preceding discussion has served as an introductory inquiry into the role of fishing in the development of agricultural systems. The traditional view of foragers becoming farmers has been contested on the grounds of what modern ethnographic examples reveal about the problems of transition. That such a transition is unlikely to develop from within is also understood in terms of a theoretical analysis of the structural differences between foragers and farmers. The case for fishing as a viable alternative has been made on the basis of archaeological and ethnographic data. None of these constitute proof though all are suggestive of the fruitfulness of this line of investigation.

In CHAPTER ONE the ethnographic data on ~~foragers~~ becoming farmers was examined. It reveals that there is resistance to change, especially in the realm of social relations. There seems to be a qualitative difference between foragers and farmers that prevents a ready and smooth transition from one to the other. Given our interest in the origins of agriculture, these data are problematical in that they do not provide examples of pristine internally-generated evolution to farming. The ethnographic data are also wanting in terms of the time depth of analysis. Though it is difficult to measure the time necessary to develop and

adjust to an internally generated change, it is also unclear as to how long it takes to adapt to introduced innovations. This latter point, however, is amenable to future research. The intensive study of modern foragers over the past 30 years has provided an expanded ethnographic present from which to study functioning cultural systems. The studies by Brook et al. (1984), Cashdan (1984), and Hitchcock and Ebert (1984) are examples of research using these data to analyze the shift to food production among Kalahari foragers. Such research may help us to understand the rapidity by which agriculture became widespread and how it so quickly evolved into more complex social systems.

CHAPTER ONE also presented some general details on the archaeological problems of modeling agricultural origins. Its development must be viewed as a gradual process marked with reluctance or inability to give up foraging. The increased reliance upon cultivated foods was dependent, not only on the evolution of the domestic species, but upon the development of the procurement systems. This seems to have occurred at a time of climatic fluctuations. All these developments seem to correlate with population growth, larger and more stable communities, and political institutions leading to states and nations (Gray 1976:77-8). It is in the context of these processes that the archaeological data must be viewed.

In CHAPTER TWO a marxist analysis was presented that highlighted the analytical differences between foraging and

farming. The approach was insightful in that it provided the conceptual tools with which to consider both the technical and social dimensions of production. Interest was in the concept of the primitive communist mode of production, since it was probably in this context that farming first developed.

As it stands, however, it is difficult to conceptualize the evolution out of foraging. It is easier to understand, in the context of farming, the evolution out of the primitive communist mode via the social process of increased production and surplus accumulation. Though there are examples of complex societies based on the limited productive forces of foraging, such as the Kwakiutl and Calusa, ~~is~~ is, as yet, no clear understanding of their evolutionary significance. The high level of productivity is important, but the mechanisms for a technical shift in production have yet to be understood. This point is also evident in the problems associated with attempts to develop archaeological models of agricultural origins. Within the marxist framework there is debate over what constitutes the dominant structure of a foraging social formation and how it may be transformed. This issue was not resolved. Rather, an inventory was presented of the structural differences noted between foragers and farmers. The two were seen as qualitatively different social formations. The exercise was to develop criteria which measured the relative social complexity of freshwater fishing societies. This assessment was done in the fourth chapter.

CHAPTER THREE introduced the early prehistory of fishing activities. The archaeological literature has not ignored fishing, but it has not been systematically explored with respect to the development of agriculture. This chapter presented evidence of freshwater fishing in the nuclear zones of agricultural development. Though the evidence exists, it does not always indicate fishing was a major subsistence source. But, the record is incomplete, with a great deal of debate over what are the exact ecological locales of agricultural origins. It is worth noting that in terms of social evolution, fishing technologies, and the reliance on aquatic resources, were a significant cultural development of the late Pleistocene. By 12,000 years ago there were cultures that could be defined as fishing. Given the incomplete archaeological record, and the problems associated with many models for agricultural origins, there is plenty of room for future research into the prehistoric exploitation of aquatic resources. That this may be a fruitful avenue of investigation is further supported by modern ethnographic data and the theoretical analysis of pre-agricultural societies.

Little attention has been directed to the study of the evolutionary significance of fishing activities or fishing societies. Though fishing is acknowledged as a foraging activity, it is generally omitted in discussions about foragers. The cross-cultural evidence, however, indicates that it is an important and widespread activity in both pre-agricultural and agricultural societies. It is therefore essential to distinguish

between simple small-scale societies, which practice (or subsist primarily upon) fishing, from those engaged in more advanced peasant or commercial fishing. Further, it is important to distinguish between maritime and freshwater fishers. Any differences may have been important in the context of post-Pleistocene adaptations.

The cross-cultural method is a useful tool for generalizing about cultural-types that avoids the historical particularism of single-case studies. Such generalizations are better suited for applying ethnographic data to discussions of prehistory and social evolution. It was to this end that the method was applied in CHAPTER FOUR.

A sample of 18 freshwater fishers was compared to a sample of 36 foraging societies. The cultural traits assessed were selected with reference to the structural differences noted in CHAPTER TWO between foragers and farmers. Latitude proved, for some traits, to be an influential factor. Slavery, for example, tends to occur more frequently among fishers located below 45 degrees latitude, than among those located above 45 degrees. In an effort to detect the influence (direct or otherwise) of this factor, each of the samples were divided into a high and low latitude sub-sample. Correlations were assessed in terms of what percentage of a population exhibited a certain trait, and in terms of a measure of association or covariation (Yule's Q). Reference was made to existing cross-cultural studies in terms of survey design, and for analysis of the data. Column numbers from

the ETHNOGRAPHIC ATLAS were included with each table to aid the reader in further assessing the quality of the coded data and the quantitative definitions used in constructing TABLES 4-13. An attempt has been to be explicit, noting the benefits and drawbacks of the cross-cultural method.

The survey provided positive correlations for a number of characteristics that indicate higher social complexity among fishers. The survey suggests freshwater fishing societies tend to maintain larger and more sedentary communities than terrestrial foragers. Class stratification and slavery are also prevalent. There are, however, a number of weak correlations that raise questions demanding further inquiry. For example, the data on craft specialization (which served as an indirect measure of commodity exchange) suggest weaving and pottery are not especially important elements. Leather working, however, proves to have a strong association with fishing. It is unclear why the first two activities are not prevalent or more important among fishers.

The data concerning hierarchies beyond the local community and on the office of headman also show correlations that do not readily support the hypothesis. They show, in general, only weak to moderate negative associations. This was the opposite to what was anticipated. Problems may lie with the coded data.

These results make an important contribution to our understanding of freshwater fishers. The general statements that can be developed about such societies are useful in discussions

of prehistory and social evolution. The results from our survey support our hypothesis. Given the nature of the data, and the kinds of questions we were asking, we should not expect positive results across the board. The number of positive results that were obtained serve as a good measure of success.

It is worth noting that the hypothesis could have been tested indirectly using the cross-cultural data of tropical incipient farming societies. It would be interesting to see if there is a correlation between the occurrence of these societies and the contribution of fishing to subsistence. Perhaps this farming strategy may develop, or occur most frequently, within a riverine context where the conditions for non-irrigated food production is best. This thesis is suggested, for example, by the evidence from the Huaca Prieta site in northern Peru. The lowest levels (ca. 2300 B.C.) provide early data on incipient farming. The context is riverine and there is a heavy reliance on aquatic resources and there is little evidence for the exploitation of land mammals (Steward, Faron 1959:77).

The social and evolutionary significance of fishing demands greater attention. An inquiry into its nature can lead insight into problems of prehistory, the theoretical analysis of social change, and into our understanding of contemporary cultural variations. The preceding chapters have explored fishing in terms of these aspects of the problem of agricultural origins.

NOTES

CHAPTER ONE: INTRODUCTION.

1. The term 'forager' is used in lieu of the more cumbersome terms 'hunter-gatherer' and 'gatherer-hunting' societies and is used to imply a general subsistence activity that can include hunting, gathering, and fishing. Such terms highlight the ecological relations a community has with its environment, and may be understood as referring to the forces of production. In general discussion, I use the term forager to refer to terrestrial hunting and/or collecting activities, or of hunter-gatherers as a general cultural type. I reserve the term fishing to apply to a more specialized foraging activity where the primary subsistence source is from the exploitation of aquatic resources. Though there is a strong correlation between foraging and what has been termed 'band organization' I wish to refrain from this determinist understanding. The terms agriculture, farming, and horticulture have a similar technical meaning and should be understood as describing societies which gain a primary subsistence source from these activities.

2. Lee (1981:16) cites these three changes as "important contradictions between the productive forces characteristic of farming and herding, and the relations of production

characteristic of hunting and gathering". The statement is made in reference to the !Kung San of Botswana who are experimenting in farming.

3. Y. A. Cohen uses the term "fundamental conservatism" (1968:122) to describe the resistance of social relations to accommodate technological innovation. This term carries negative connotations, however, and is better understood as cultural lag. With the development of agriculture this lag must be seen as a proximate condition of change. This must be separated from the larger evolutionary view of increased social complexity through time. The knowledge foragers have of their environment constitutes a far more complex force of production than that of simple farming. The shift to the latter does not necessarily involve a change to greater technological complexity in the sense of tools or knowledge, but may initially involve a reduction of such. The more complex social systems that develop, however, seem to maintain an element of instability that favours progressive, accumulative change. This is often viewed as a transition from simple farming to chiefly, Big-Men, or lineage-type societies to states and nations.

4. Bender (1978) is an exception. She notes the general failure to incorporate the social dimension into models of agricultural origins and presents a model that sees sedentism promoting increased productivity, and through feedback loops, promoting

hierarchy which, in turn, encourages increased production. Her discussion rests on the notion that increased social complexity is an inevitable outcome of social evolution and that the higher productivity that comes with intensification and agriculture can be recognized and promoted by group leaders. This has not been demonstrated. R. Dennell (1983) also notes the problem of archaeological models that omit the social dimension. He proposes a framework that encompasses the traditional material aspects of archaeology, the social relations of the society, and their relationship with the animal competitors in the environment. He admits, however, that data for the latter two are difficult to discover in the archaeological record.

5. Depending on the theorist, the important qualities of this population vary: for example, M. Harris (1979) argues the transition depends on certain cost-benefit ratios, M.N. Cohen (1977) argues that demographic saturation is important; in a similar vein, Binford (1968) argues for conditions of disequilibrium in sub-optimal zones; while Rindos (1984) argues symbiotic relations and inherent cultural instability fostered the rise of agriculture.

6. As noted earlier, there is an opposition between the foraging tendencies of nomadism, diffuse ownership of property and sharing, and the sedentism, private ownership, and husbandry of resources commonly attributed to farmers. Perhaps in special

foraging contexts these latter conditions exist (i.e., fishing economies) and create the internal contradictions (eg. diffuse ownership in a sedentary context) that foster social evolution. This notion has yet to be explored in terms of a marxist framework. Though this paper focuses on just these circumstances, the analysis of fishing societies is not in terms of a mode of production concept. I suggest, however, that these contradictions may be a fruitful avenue for a marxist understanding of social evolution.

7. That the Ik practice vegeculture indicates an extensive knowledge of the flora of their region. This is understood as an essential precondition for the development of agriculture during the Neolithic (cf. M. N. Cohen 1977:23) but does not imply this as an inevitable outcome. Terraced farming is a recent innovation for the Ik (i.e., 1930s) (Turnbull 1967:67) and is different from vegeculture which is a generalized agriculture primarily dependent upon vegetative reproduction as opposed to seed-reproduced crops (D. R. Harris 1969:9-10). Propagation is from cuttings taken from leaves or stems. The technique tends to maintain stable, complex ecosystems that require little work after planting though they are often less productive than seed crops (Wenke 1980:303). Wenke notes that in Southeast Asia the practice of vegeculture probably did not lead to the development of seed crop cultivation (1980:304).

8. This idyllic view of the Ik must be accepted with some caution. It is a reconstruction that is not based on systematic field research. At the time of Turnbull's research this way of life, if it had existed, had passed. Turnbull's writing varies between positive and negative reports and between descriptions of them as foragers and farmers (cf. 1966, 1967, 1968, 1972).

CHAPTER TWO: A MARXIST ANALYSIS OF FORAGERS AND FARMERS.

9. In certain writings Marx was concerned with the evolution of private property and though his discussions were in terms of evolutionary stages (primitive communism, ancient, slave, Asiatic, and capitalist modes) they need not be considered chronological in the sense of unilineal evolution, but rather as analytical stages (Hobsbawm 1964:36). Thus we may speak of contemporary societies within the productive stage of primitive communism.

10. I use the term 'social formation' to refer to the whole of a society, i.e., the infrastructure, the judicial-political, and the ideological levels. This avoids confusion with the concept 'mode of production' which I will use in the restricted sense of economic base (composed of both the forces and relations of production) (cf. O'Laughlin 1975:350). Hindess and Hirst provide a similar definition for social formation but stress that its non-economic elements constitute essential conditions for the

existence of a given mode of production (1975:13).

11. Hindess and Hirst (1975:22-?) argue that this equality is reflected in the structure of the primitive mode of production. It is characterized by only two levels: the economic and the ideological. The latter dominates the social formation in the form of kinship which serves to define social relations of production and reproduction. With this concept, however, it is difficult to model the shift from egalitarian to advanced, stratified horticultural and agricultural societies. At what point does one introduce the political level into the analysis?

12. As the case studies in the introduction illustrate, the conditions for primitive accumulation are not necessarily self-evident and may be opposed by preexisting social constructs.

13. Bender (1978) argues that as societies evolve greater leadership and authoritative roles, a corollary is increased surplus production. Abernethy (1978) notes, however, that accumulation of surplus alone does not alienate the producer and that much depends on what is measured as wealth.

14. For example, Godelier (1979:83-4) notes for the Mbuti pygmies that at least four bands must cooperate in order for the society to reproduce itself through the established matrimonial exchange system. Among other things, this ensures all individuals access

to essential resources. Similarly, Asch (1979:91) notes the important reproductive role of the larger Slavey Indian cooperative of which local groups are members.

15. The concept of primitive communism applies most readily to foragers where the relationship with the land is one of low productivity per unit land, but with highly productive labour. Farming can increase the productivity of the land but diminishes the productivity of labour (Meillassoux 1973:201). Depending on the social criteria for the level of production, farming may or may not be understood by this concept. Such a distinction could clarify the imprecise use of ethnographic material noted against Leacock (1978) in her discussion of egalitarian societies (cf. Cohen 1978:257-9; McElroy 1978:264).

CHAPTER THREE: THE ARCHAEOLOGICAL RECORD FOR FISHING AND THE DOMESTICATION OF PLANTS.

16. The concept of the Mesolithic has been used in non-European contexts. For example, Garrod (1957) uses the term in reference to the Natufian cultures of the Levant, and Gorman (1971) applies it to the Hoabinhian cultures of Southeast Asia.

17. Rindos is critical of the conception of equilibrium as the normal relation between a population and its environment. To assume a culture operates or strives to maintain adaptive

equilibrium is to infer motivation on the part of cultural change. To do so is teleological and an error functional modeling (1984:1-36).

18. Lathrap admits the initial dispersal of the domesticated bottle gourd from Africa is problematical and lacks a suitable mechanism for explanation. I am inclined to think, however, that it is unnecessary to model early Neolithic experimentation with a gourd from Africa as being an essential impetus to all subsequent agricultural systems (cf. Reed 1977:930-35). Comparable patterns of experimentation in suitable environments seems like explanation enough for the development of agriculture. There is no denying however the problem posed by the occurrence of the bottle gourd, already as a cultigen, in the early post-Pleistocene levels of Southeast Asia and the nuclear areas of America (Lathrap 1977:722).

19. Both Gorman (1977:349) and Lathrap (1977:737-8) suggest ~~rising sea levels at the close of the Pleistocene would have led~~ to higher population densities and the need to intensify the food procurement systems. Such eustatic changes would have forced coastal and lower riverine populations to shift to more upriver habitats. The relatively rapid loss of land area (up to half in Southeast Asia) may have stimulated technical and social innovations. Gorman notes for Southeast Asia that these implications have yet to be fully explored. Lathrap notes the

changes were less dramatic in South America but that any change would be more readily felt in coastal and riverine environments.

CHAPTER FOUR: THE CULTURAL AND EVOLUTIONARY SIGNIFICANCE OF FISHING SOCIETIES.

20. There cannot be a precise definition of fishing and at some point inclusions must become arbitrary. For example, I include whales and seals in the definition but not sea otters, beavers, muskrats, moose, or water fowl. I include, however, frogs, turtles, and crocodiles. See Hewes (1948:238-9) for a discussion of this problem.

21. Harris (1969:9) notes the more sedentary nature of surviving fishing cultures, and suggests that in some areas it could have been of special significance for early domestication and cultivation. In a paper entitled ALTERNATIVE PATHWAYS TOWARD AGRICULTURE he notes, however, that the exploitation of rich aquatic resources in temperate coastal and river areas "appears not to have functioned as an evolutionary pathway toward agriculture" (1977:220). His discussion, however, is not directed towards tropical adaptations where there may be less of a scheduling conflict between fishing and the gathering of other foods. This condition is partially explored by Lathrap (1970, 1977).

22. Hewes provides the most useful discussion of fishing activities. His perspective is general enough to be relevant to both freshwater and maritime contexts. Much of the literature concerning fishing is focused on maritime activities in the context of simple commodity production. As such, they become less relevant to our discussion here (cf. Acheson 1981; Leap 1977; Norr, Norr 1978).

23. For example, people of the Northwest coast can symbolically claim ownership of resources, including aquatic resources, and demand tribute in recognition. In some cultures, certain trees may be considered as private property for which special claim is made (Lenski and Lenski 1982:458, note #72).

24. Faris (1977:235-6) notes some of the taxonomic problems in classifying fishing societies and the implications these hold for notions of social evolution (cf. Faris 1975:242).

25. An aid to tracing cultures listed in the ETHNOGRAPHIC ATLAS is provided by Barry, III (1980). As part of the twenty-eighth installment of the ATLAS an alphabetical listing of all 1,167 societies so far included is presented. The list includes the culture's regional identification code within the ATLAS, its cluster classification, and whether it was one of the 862 cultures listed in the ETHNOGRAPHIC ATLAS. With this list it is easier to compare the cultures used in different studies.

26. The follow examples of low latitude freshwater fishing cultures are not listed in the ETHNOGRAPHIC ATLAS. In Africa the Kisi of Lake Nyasa (Tanzania), the Unga (Zambia), the Nkoya of the middle Zambesi, the Twa (Zaire), the Kenyi and Ruli of Lake Victoria (Uganda) (Winterbottom 1944), and the Pygmy groups near Lake Mweru, Lake Bangweulu, and the Kafue River (Zambia) (Murdock 1959:49). In South America, The Myra of the lower Madeira River is also not listed. Three other groups are coded in the ETHNOGRAPHIC ATLAS as non-fishers. (by our definition) though Steward and Faron (1959:437-44) note them as fishers. They are: the Guato (upper Paraguay River), the Yaruro (Orinoco tributaries), and the Warrau (Orinoco Delta). The differences may depend upon what group was studied for coding within any one culture or society. The above fishers may be sub-communities of a larger population.

27. Yule's Q is expressed as:

$$Q = \frac{ad - bc}{ad + bc}$$

where a, b, c, and d represent the cells of a two-by-two matrix. The degree of association between any two traits can be termed from:

- (1) weak (Q = 0 to .20, 0 to -.20),
- (2) moderate (Q = .20 to .49, -.20 to -.49), and
- (3) strong (Q = .50 to 1.0, -.50 to -1.0).

There are problems when one of the cells in the matrix is zero

because the coefficient measures a spurious perfect association between traits. Circumspection should be exercised with such results. In TABLE 10 (feather working) for example, the frequencies in the two-by-two matrix were modified to control for the weakness of R under these conditions. The exercise allows us to better interpret the "perfect association".

APPENDIX ONE

List of the Freshwater Fishing Societies Selected from Murdock (1967). The Criteria for Selection is Discussed in APPENDIX THREE.

Name	Subsistence Economy (a)	Location (b)
1. Wongaibon	33400	32S, 146E
2. Wintu	33400	41N, 127W
3. Korok	41500	42N, 123W
4. Klamath	32500	43N, 122W
5. Agaiduka	33400	44N, 112W
6. Tenino	32500	45N, 121W
7. E. Ojibwa	33400	46N, 85W
8. Wishram	32500	46N, 121W
9. Sanpoil	32500	48N, 119W
10. Stalo	33400	49N, 122W
11. Kutenai	33400	50N, 117W
12. Chilcotin	23500	52N, 122W
13. Attawapiskat	13600	53N, 83W
14. Alkatcho Carrier	14500	53N, 126W
15. Kaska	14500	59N, 128W
16. Ingalik	14500	62N, 160W
17. Dogrib	23500	63N, 117W
18. Kutchin	14500	66N, 135W

(a). The subsistence codes are the same as those in the ETHNOGRAPHIC ATLAS (1967:46-7). The first digit refers to

gathering; the second, to hunting; the third to fishing (including sea mammal hunting and shellfishing); the fourth, to animal husbandry; and the fifth to agriculture.

The numbers in each column refer to the degree of dependence:

- 0= 0-5% dependence
- 1= 6-15%
- 2= 16-25%
- 3= 26-35%
- 4= 36-45%
- 5= 46-55%
- 6= 56-65% etc.

(b). The societies are ranked in order of increasing degrees latitude.

APPENDIX TWO

List of Foraging Societies from Murdock (1967). The Criteria for Selection is Discussed in APPENDIX THREE.

Name	Subsistence Economy (a)	Location (b)
1. Dorobo	46000	0, 36E
2. Mbuti	63100	2N, 28E
3. Hadsa	55000	3S, 35E
4. Shiriana	34300	4N, 63W
5. Semang	43300	6N, 101E
6. Murngin	53200	12S, 136E
7. Wikmunkan	44200	14S, 142E
8. Bororo	45100	16S, 55W
9. Botocudo	54100	18S, 42W
10. Kung	82000	20S, 21E
11. Chamacoco	64000	20S, 59W
12. Chichimec	54100	22N, 100W
13. Aweikoma	46000	28S, 50W
14. Dieri	73000	28S, 138E
15. Kiliwa	43300	31N, 115W
16. Cupeno	64000	33N, 117W
17. Yavapai	64000	35N, 112W
18. Kaibab	73000	36N, 113W
19. Tubatulabal	53200	36N, 118W
20. Yokuts	43300	36N, 120W

... continued ...

APPENDIX TWO (continued).

Name	Subsistence Economy (a)	Location (b)
21. Washo	43300	39N, 120W
22. Patwin	53200	39N, 122W
23. Kuyuidokado	52300	40N, 119W
24. Yuki	43300	40N, 123W
25. Achomawi	34300	41N, 121W
26. Shasta	26200	41N, 122W
27. Modoc	53200	42N, 122W
28. Tasmanians	44200	42S, 146E
29. Micmac	15400	47N, 65W
30. Rainy River	34300	49N, 92W
31. Eastern Cree	25300	51N, 85W
32. Tahlitan	15400	58N, 131W
33. Slave	15400	61N, 120W
34. Caribou Eskimo	15400	63N, 96W
35. Nabesna	26200	63N, 141W
36. Yukaghir	15400	70N, 145E

(a), (b). See APPENDIX ONE.

APPENDIX THREE.

The Procedures by which Societies were Selected for Cross-cultural Analysis.

The eighteen cases of freshwater fishers and the 36 cases of foragers that were analyzed were selected from the 862 societies listed in the ETHNOGRAPHIC ATLAS (1967). This publication is a summary of societies presented in the journal ETHNOLOGY between 1962 and 1967. The summary excluded 307 societies listed in the first 21 instalments. It was decided to review these latter cases in an effort to expand the survey. Further, a review was made of the 97 subsequent additions to the ATLAS (instalments 23 to 28; i.e., ETHNOLOGY 1967, 6(4):481; 1968 7(1):106, 7(2):218, 7(3):327; 1971, 10(1):122; 1980, 19(2):245). As such, a total of 1,166 societies were reviewed. The effort added few new societies but it did provide the opportunity to update the codes of some cases.

Each fishing society was initially selected in terms of those with a subsistence based primarily on fishing activities. Any ~~society that had an equal contribution from another subsistence~~ source was omitted. The effort was to include only those societies that could be indisputably labeled fishing. In all cases, those societies with any subsistence contribution from animal husbandry and/or farming were omitted. Interest was kept to societies that were not involved in any form of food production.

The foraging societies were identified in a similar manner.

Only those with a subsistence contribution from gathering, hunting, or fishing were considered. These societies were also screened to exclude equestrian hunters since this activity represented a significant post-contact cultural development. Identification of such societies was made with reference to column #39 in the tables of coded data - Type of Animal husbandry. Control for this characteristic was also exercised by Lee (1968) and Ember (1978) in their surveys of foragers.

The next step was to exclude all societies that occurred in a maritime context. The reason for this is explained in CHAPTER ONE and THREE. Selection involved the slow process of locating each society on a map using the coordinates listed for each society in the section "classification by clusters" (1967:7-45). With this geographical context a decision could be made as to the nature of each society's subsistence base.

If doubts still remained, attention was directed to the original ethnographic material. Within the section "classification by cluster" each society has a reference to a volume of ETHNOLOGY where a bibliography for it is provided. By this means, it was possible to exclude from the listings all societies that occurred in a maritime context and who directed their fishing activities to maritime exploitation.

Despite this, there are a few selection problems. Some societies are located within a freshwater context but depend primarily on the spawning runs of maritime fish (eg. salmon). In a related problem, certain inland peoples have adopted certain

cultural traits from more socially complex coastal groups. For example, the Alkatcho Carrier Indians inhabit the eastern slopes of the Coast Mountain range in British Columbia and had a culture similar to the Athabaskan before adopting west coast social forms about 1800 AD (Goldman 1940). They are now classified by cluster as Kwakiutl-Bellacoola (Murdock 1967:33). It was decided in such cases to include the society in the survey. If the location of settlement and the context of exploitation was freshwater the society was included. If, however, an inland fishing population moved seasonally to a coastal region to exploit maritime resources, it was excluded.

The final selection process involved representation within a cluster. The ETHNOGRAPHIC ATLAS lists 412 groups or clusters of societies which share common cultural, historical, and/or geographical traits. The number of societies listed under any cluster varies, thus some include several (eg. Ojibwa and Northeast California clusters) and others only one. In part, this indicates the unequal representation of societies within the ETHNOGRAPHIC ATLAS. Rather than survey every possible society that meets our subsistence criteria, it is best to select one to represent a group of genetically related societies. A world sample is best achieved by controlling for the geographical distribution of cases in order to better measure functional associations rather than those of diffusion.

To maintain as much statistical integrity as possible it is important to select a case to randomly represent a cluster if a

number of societies are available to choose from. With respect to freshwater fishing societies, there were so few cases to choose from that in general, a cluster included only one such society. Where a choice was available, a case was selected by the throw of a die. This was also true of most foragers from the Old World and South America; there are so few that there was usually no more than one to a cluster. The vast majority of foragers listed in the ETHNOGRAPHIC ATLAS are from North America with several to a cluster. The selection of these was also by the throw of a die.

In summary, all societies surveyed here were controlled for such characteristics as (1) the subsistence contribution from herding and farming, (2) the maritime context of resource exploitation, and (3) the use of horses for hunting. All potentially suitable societies were grouped by cluster and then the 18 fishing societies were selected. The 36 foraging societies were selected from the remainder. One society was selected per cluster though it was possible to have a cluster represented by one fishing and by one foraging society. Though the attempt was made to keep the selection as random as possible, in many cases there was only one society that could represent a cluster. Because the quasi-universe of the ETHNOGRAPHIC ATLAS is not a representative or random sample of the universe of all cultures, the above effort makes our sample more representative of all documented societies.

2

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