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INTERACTIONS IN A TRANSITIONAL ENVIRONMENT

THE KENAI PENINSULA

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INTERACTIONS IN A TRANSITIONAL ENVIRONMENT

THE KENAI PENINSULA

By

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ABSTRACT

INTERACTIONS IN A TRANSITIONAL ENVIRONMENT
THE KENAI PENINSULA

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This thesis addresses the prehistoric interaction of the Tanaina Indian and the Pacific Eskimo on the Kenai Peninsula of Alaska. Distinction and definition of populations and the effects of interaction as a process of change are considered in the context of a transitional region, the interface between biological communities. Ecological theory is used as groundwork in the development of predictive models of interaction. Cultural interaction meets the needs of groups to survive autonomously and to cooperate. The concepts of niche, habitat, ecotope, and ecotone are used to categorize the populations. The interaction models, synthesized from ecological and anthropological research, are competition, predation and parasitism, mutualism, proto-cooperation, commensalism, and neutrality and independence. Environmental, historical, and cultural information is detailed in explanation of the derivation of the problem. Pertinent ecological concepts and applicable anthropological perspectives are reviewed. The application of the models in explanation of Kenai Peninsula prehistory is discussed.

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INTRODUCTION

One trend in behavioral and biological sciences is to emphasize particulate inquiry: the nature of the cell, the individual, the population, the culture, or society. As these units become understood, investigation expands to the interrelationships between units and their processual development. Research changes from reduction and definition of parts to a wholistic explanation of living systems. Historically, research has oscillated between these two poles of interest.

This thesis involves an integration of both of these perspectives of behavior through a regional and an ecological approach. Concern shifts among entities (cultures, populations) and process (pattern, system, change). Being a regional study, this work (1) deals with the structure and function of individual populations by examining patterns of settlement, the selection of particular resources from alternatives, and the distribution of these resources; (2) surveys interactions between cultural populations within a region; and (3) presents human populations as part of a larger ecological

community. Using ecological methodology, cultural populations are described by niche and habitat within a region and as part of a life system.

Anthropologists from varied schools of thought find the regional approach to research a valuable one. For example, Watson, LeBlanc and Redman, archaeologists, refer to the necessity of the wholistic survey to obtain a picture of cultural process, "To do this one must study the total system of interacting communities and their environmental milieu" (1971:93). Suttles, an ethnologist, in his analysis of habitat or cultural variation in a region, states,

> . . . we need much more work on the ecology of the Northwest Coast, on the relations of local groups to resources, on the system of exchange of food and wealth among groups. . . . Seen in a framework that includes ecology, questions of migration, diffusion, and the persistence of values assume their proper places as parts of the larger whole, the study of culture change as an evolutionary process. (1968:105-106)

Binford speaks for many anthropologists when he generalizes, "The methodology most appropriate for the task of isolating and studying process of culture change and evolution is one which is regional in scope" (1964:425). It is from this heritage that this thesis developed.

This study is focused on regions and the patterns of interaction associated with a particular ecological context. This context is a region which contains an edge

or transitional zone between two ecological communities. Within a transitional zone, populations may be either (1) at the edge of the functional ecological ranges (but without the necessity for cultural adaptation), or (2) particularly adapted to ecotone (transitional area) exploitation. When separately defined human populations interact, the ecological setting affects the population's regional distribution and subsistence strategy. How this occurs can be examined by developing models of population interaction patterns.

These models of interaction can define space and form and can explain the structure and function of systems. The models are synchronic in nature, but their application can contribute to an understanding of a diachronic process. The use of models of system and pattern form the basis for understanding the development and change of interrelationships.

The purpose of this work is to develop such models of patterns of interaction. The result is an analytical tool. These models are then examined to see how they might be used to postulate spatial and temporal relationships between cultures in a particular transitional region of Alaska. The intention of this work is to perform a precedent investigation of system and pattern in space and form to serve as a foundation upon which to explore developmental process.

The thesis is organized in the following manner. First, the origin of the question is described. Next, ecological concepts which are elemental to this work are reviewed and some related studies are examined. The perspectives and concerns of anthropologists are then discussed and relevant ethnographic material is presented. A set of models of interaction is described, and then the models are applied to a specific regional setting. Finally, the contributions of this thesis to continuing research are considered.

ORIGIN OF THE PROBLEM

For six months during 1972, the writer conducted a study on the Kenai Peninsula of south-central Alaska. This work was funded by a Youthgrant (Ay-8087-73-88) from the National Endowment for the Humanities. The primary objectives were to gain field experience and to compile an anthropological study of Ninilchik, a contemporary and historic village. The attention of that study was focused on four areas: (1) an archaeological survey (to find information about the acculturation of the village native population), (2) a study of village folklore (to reflect community characterization of the modifying and changing culture), (3) an ethnographic and developmental description of the village, and (4) a consideration of the environment as echoed in community art. The questions explored in the present thesis developed from this research.

This thesis not only suggests explanatory models, but employs those models in detailing a prehistoric population's ecological adaptation in the Kenai region. A description of the environment, culture, and history of

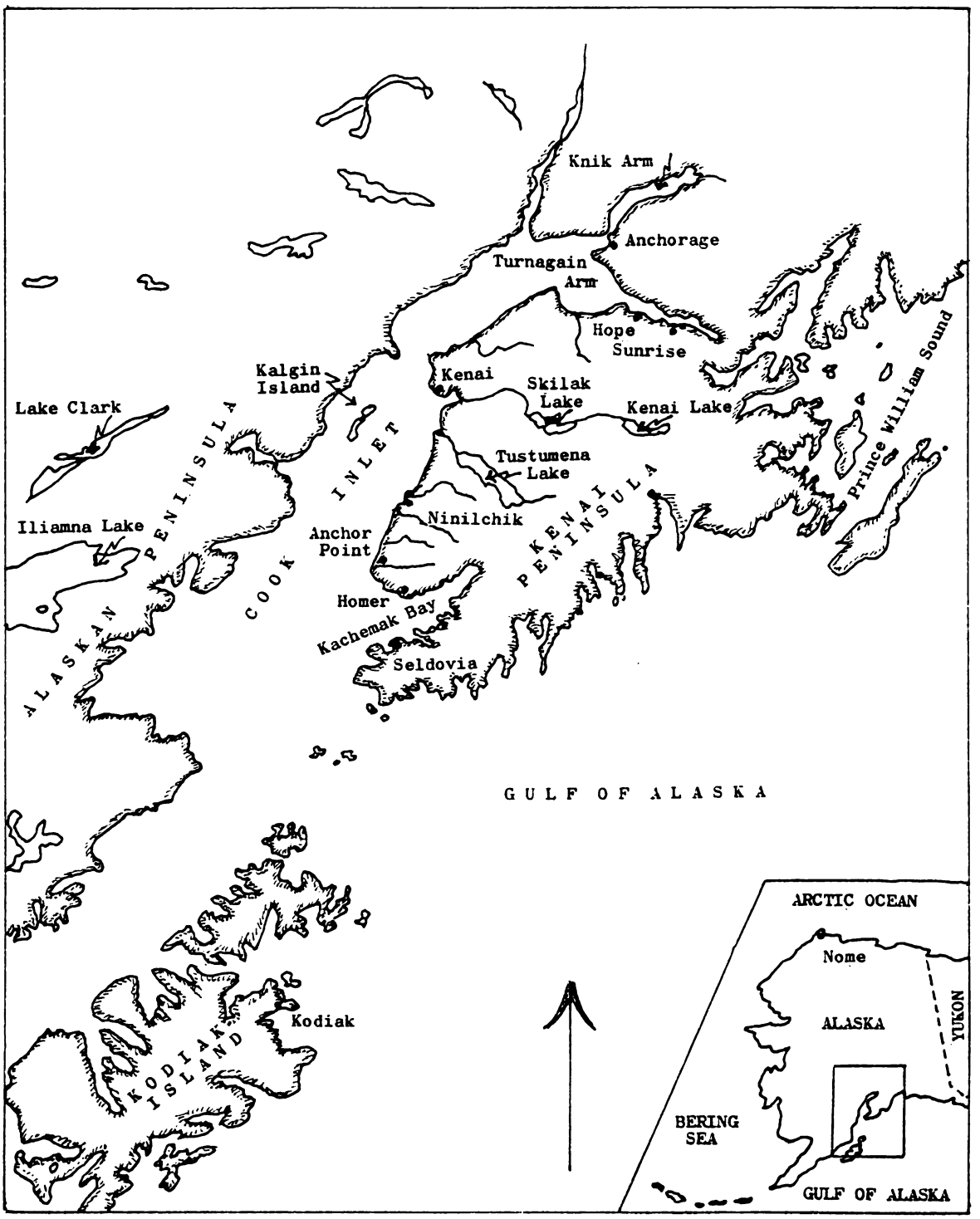


Figure 1

Map of the Kenai Peninsula and Surroundings. (Adapted from the National Geographic Society, 1965, Alaska, Washington, D.C.)

the Kenai region follows. This description demonstrates the derivation of the problem and provides a setting in which an analysis can be understood and applied.

The Environmental Setting

The Kenai Peninsula is located between the parallels of 59^{o} and 62^{o} north longitude and the meridians of 148^{o} and 152^{o} west latitude. The peninsula is approximately 150 miles long from north to south and 100 miles wide at its maximum, averaging 45 miles wide from east to west. The region is naturally bordered by major water bodies. Prince William Sound and the Gulf of Alaska are located to the east and south while Cook Inlet is to the west. The northern boundary is the Turnagain Arm of Cook Inlet where it is virtually separated from the mainland (Bennett, 1918).

With information compiled from Bennett (1918), Martin et al. (1915), and Rieger et al. (1962), the peninsula can be divided into two physiographic areas: (1) the Kenai Mountains with glaciers and ice fields and (2) the Kenai lowlands and intermediary hills. The mountain area is predominantly located along the eastern part of the peninsula. The peaks there range in elevation from 3000 to 5000 feet. Ice and snow fields are bordered by alpine tundra. The majority of the barren region (known as the Harding Ice Fields) is not suitable for

human habitation, not known to have been a source of utilized resources, and not amenable to field research. That region is not of concern to this study except in that it serves as a boundary and affects the climate. Lower mountains, reaching above the 2000 foot timberline and topped by alpine tundra, are of concern as the loci of resources exploited for subsistence by human populations. These mountains are in the Seward Turnagain Arm area and in the southeast, the Caribous. The mountains are geologically differentiated from the lowland as they consist of Mesozoic indurated, slightly metamorphosed and highly folded rocks.

The second physiographic region of the peninsula, the Kenai Lowland, is the area of principal interest for this thesis. This broad area consists of low hills, broad level plains, bogs, lakes, rivers, and streams (draining west into Cook Inlet). The general elevation is 200 feet and does not exceed 500 feet. The base of the lowland is a gently folded, tertiary (Eocene) Kenai formation of silty, sandy sediments and thin lignite bed. This is covered by thick glacial and alluvial deposits. During maximum glaciation, the lowland and Cook Inlet was filled by a valley glacier.

The shore of the peninsula along Cook Inlet is characterized by a sharp bluff formed from heavy wave action and is currently eroding at an average rate of one foot a

year. The bluff ranges from 20 to 200 feet high and is interrupted only by major streams and rivers. At low tides a beach is formed which continues into the inlet as a wide, shallow shelf. The shoreline consists of smooth, open curves with few distinct natural bays and harbors except in the extreme south.

The southwestern shore, at the mouth of Cook Inlet, is dominated by the large expanse of Kachemak Bay. The southern edge of Kachemak Bay and the remaining southern and western shore of the peninsula are characterized by numerous small bays and deep forges into the mountains. This thesis is concerned with known habitation sites along this extremely rugged shore (though ecological interaction of associated populations is primarily with the maritime environment).

Viereck and Little (1972) identify the climax vegetation of the lowland as the Kenai Lowland Phase of the Coastal Spruce-Hemlock Forest. The criteria distinguishing the phase are a relatively low proportion of hemlock and a relatively greater proportion of deciduous to coniferous trees. The lowland phase exhibits two vegetational types: coastal spruce-hardwood forest to the south and an open, low-growing spruce forest to the north. These types can be seen as part of the generalized Alaskan pattern of two separate forest groups being (1) the coastal type spruce-hemlock forest and (2) the interior

type spruce-hardwood forest. The vegetation of the lower elevations of the mountains on the southern and western shores is of the first type, coastal spruce-hemlock forest.

Specifically within the Kenai Lowland Phase of the Coastal Spruce-Hemlock Forest geographical differentiation of the dominant and major genera, Picea (spruce) is noted. The species found mainly in the northern part of the lowland is the white spruce (Picea glauca.). The species dominating the south is the Sitka spruce (Picea sitchensis.). Hybridization of the two species has taken place in an intermediary zone (centering along an east-west axis approximately through the village of Ninilchik). Additional north-south differentiation is noted in (1) the relative scarcity of hemlock (Tsuga mertinsiana.) in the north (except in the hills adjacent to the low mountainous area) and (2) in the distributional dominance of the black spruce (Picea mariana.) in the northern area. Notice also in Tables 1, 2 and 3 the variance in dominant species between each vegetational community. This north-south gradient corresponds with more precipitation in the south. An additional corresponding gradient in drainage pattern occurs with the north physiographically characterized by larger rivers, lakes, and bays.

Two secondary vegetation zones can be isolated within each type of the general forest phase: (1) forest, on

Table 1

Northern, Open, Low Growing Spruce Forest--
Dominant Species Coastal Spruce Hemlock
Forest--Kenai Lowland Phase

TREES

black spruce (Picea mariana.)

paper-birch (Betula papyrifera.)

white spruce (Picea glauca.)

quaking aspen (Populus tremuloides.)

Balsom popula (P. balsamifera.)

SHRUBS

red-fruit bearberry (Arctostaphylos rubra.)

crowberry (Empetrum nigrum.)

Labrador-tea (Ledum groenlandicum.)

prickly rose (Rosa acicularis.)

littletree willow (Salix arbusculoides.)

Bebb willow (Salix bebbiana.)

grayleaf willow (Salix glauca.)

diamondleaf willow (Salix planifolia ssp. pulchra.)

Scouler willow (Salix scouleriana.)

bog blueberry (Vaccinium uliginosum.)

mountain-cranberry (Vaccinium vitis-idaea.)

(Compiled from Viereck and Little, 1972; Bennet, 1918.)

Table 2

Southern Coastal Spruce Hemlock Forest--Dominant Species Coastal Spruce Hemlock Forest--Kenai Lowland Phase

TREES

Sitka spruce (Picea sitchensis.)

mountain hemlock (Tsuga mertinsiana.)

black cottonwood (Polulus trichocarpa.)

SHRUBS

Sitka alder (Alnus sinuata.)

rusty menziesia (Menziesia ferruginea.)

trailing black current (Ribes laxiflorum.)

salmonberry (Rubus spectabilis.)

Barclay willow (Salix barclayi.)

Scouler willow (Salix scouleriana.)

Sitka willow (Salix sitchensis.)

Pacific red elder (Sambucus callicarpa.)

early blueberry (Vaccinium ovalifolium.)

highbush cranberry (Viburnum edule.)

(Compiled from Viereck and Little, 1972; Bennett, 1918.)

Table 3

Bogs--Dominant Species. Coastal Spruce Hemlock Forest--Kenai Lowland Phase

TREES

black spruce (Picea mariana.)

dwarf arctic birch (Betula nana.)

SHRUBS

bog-rosemary (Andromeda polifolia.)

crowberry (Empetrum nigrum.)

Labrador-tea (Ledum groenlandicum.)

rusty menziesia (Menziesia ferruginea.)

Barclay willow (Salix barclayi.)

undergreen willow (Salix commutata.)

bog cranberry (Vaccinium oxycoccos.)

bog blueberry (Vaccinium uliginosum.)

mountain or lowbush cranberry (Vaccinium vitis-idaea.)

thin-leaf Labrador tea (Ledum decumbens.)

horsetails (Equisetum sp.)

fireweed (Epilobium angustifolium.)

reed-grass (Calamagrostis canadensis.)

(Compiled from Viereck and Little, 1972; Bennett, 1918.)

well drained benches, ridges or hills, and (2) heather, in swampy bogs or muskegs. The second zone is found much more predominantly in the northern region. The black spruce (Picea mariana.), also commonly called bog spruce and swamp spruce, "is characteristic of cold wet flats, muskegs, north-facing slopes, silty valley terraces, and lake margins in the spruce-birch interior forests up to an altitude of 2000 feet" (Viereck and Little, 1972:51). This disposition of the black spruce correlates with its dominance in the northern area of the Kenai Peninsula.

The north-south gradient of vegetation types is important to this thesis as it illustrates that the Kenai Peninsula is a transitional region. This condition, though illustrated by the climax and dominant vegetation, is explained by a complex ecological schema. As secondary edge areas between secondary vegetation zones, the heather and forests also distinguish the transition, grading from north to south. As the heather is an edge between the forest and the aquatic environment, the point can be made of greater variability of environment in the north (at least terrestrially). The possibility exists that this variability is enhanced because of an "edge effect" postulated by some ecologists (this argument is examined later).

An important contribution to the understanding of the forest boundaries and transition areas was made by Griggs (1934). He studied the Sitka spruce (Picea sitchensis.) forest development, principally on Kodiak Island, 100 miles to the southwest of the Kenai Peninsula. He found, "In light of the practically unanimous opinion of observers on the ground, it is justifiable to generalize and conclude that in many places in Alaska, the forest boundaries are mobile migration fronts rather than static climatic boundaries" (Griggs, 1934:92). He suggests two interesting causes for this vegetation mobility. The first cause is that the greater region of south central Alaska is still quite geologically active. Ash cloud deposits from active volcanoes in the Aleutian Range travel for hundreds of miles over large areas, and destroy and temporarily inhibit growth of vegetation. (This volcanic range is located fifty miles across Cook Inlet from the Kenai Peninsula. Exposed stratigraphy in the shore bluff reveals thin layers of volcanic ash. This evidence is important in developing archaeological chronology and in demonstrating ecological factors. Known strata indicating large scale forest fires may be related to the volcanic activity or caused by other natural agents.) The second factor Griggs suggested that affects vegetation mobility is tetonic movement associated with the geographically "live" region, changing elevation

(rise and fall) and cline of land masses. The resulting rapid, though relatively minor ecological shifts, are stimuli for vegetation movement. It should be noted that the Turnagain Arm of Cook Inlet, the northern boundary of the Kenai Peninsula, was identified as the center of fault activity in the 1964 Alaska earthquake.

Climate has a more subdued environmental effect than that resulting from the geological activity discussed above. The peninsula is influenced by maritime and continental weather factors. On a large scale, it is described as being in transition between those two climatic zones. (The information here is compiled from Bennett, 1918; Rieger et al., 1962; Martin et al., 1915; and Viereck and Little, 1972.) The lowland is dominately influenced by the maritime factors while the high, eastern mountains are influenced by the colder and dryer continental pattern. A slight gradient in temperature and rainfall occurs from the coast of Cook Inlet into the interior of the lowland to the east, with the western shore warmer and more moist. A north-south gradient in rainfall has been described earlier. This second gradient reflects a pattern expected from the peninsula's relation to the larger coastline of southern Alaska. The interior to the north is dryer and cooler while the shore exposed to the Gulf of Alaska receives the moist warm air.

The average annual rainfall on the Kenai Lowland is 20 inches, with the major rains in July through September and the dry season in spring. The dry spring, in terms of precipitation, is offset by the saturated soil of the snow thaw. Snowfall averages sixty inches with an average maximum depth of less than three feet.

The mean summer temperature is 55°F, usually ranging to a high of 90°F. The lowest recorded winter temperature is of -45°F, though the extremes are not maintained for long periods. Generally there is great variability in temperature. The frost-free season is less than 100 days, though long periods of summer daylight increase the vegetative growth season. In isolated areas permafrost is found within three feet of the ground surface, though it is usually much deeper.

The lowland is relatively sheltered from the eastern winds by the Kenai Mountains, and from the west by the Aleutian range across Cook Inlet. Strong winds are channeled up the inlet and mostly effect the shoreline. Prevailing wind directions are from the north from September to April and from the south during the remaining months.

The animal population, environmentally dependent upon those factors already discussed, is quite diverse. Both black and Kodiak bear range on the peninsula as well as porcupine, rabbit, otter, beaver, chipmunk, Hudson Bay

red squirrel, mice, moles, marmot, shrews, American sable marten, lynx, weasel, mink, muskrat, and four species of fox. Game birds include grouse, rock ptarmigan (above timberline in the summer), ducks, geese, snipe, curlew, and plover. Birds of prey are owl, hawk, raven and the Alaskan bald eagle. Other common birds are robin, loon, gull, sandpiper, horned puffin, cormorant, magpie, woodpecker, blackbird and sparrow. A variety of fish are found in the abundant lakes and rivers. Baluga whale and seal are found in Cook Inlet. Mullusks are found on the beaches of Cook Inlet. Seasonally, the red, silver, pink, king, and dog salmon come up the Cook Inlet to spawn in the rivers (H. H. Bennett, 1918).

The large herbivores currently include the moose ranging on the lowland, and the mountain sheep feeding on short grasses in the alpine tundra of the lower mountains. The sheep are the prey of raven, eagle and lynx. Though the ranges of other fauna have fluctuated during historic times on the Kenai Peninsula, the fluctuation of that of the moose is a pertinent example. Moose feed on willow, birch, and aspen twigs, especially in open areas and in areas undergoing the initial stages of burn recovery. The moose population greatly increased after 1870 and reached a peak in 1913. In 1916 the peninsula was proclaimed as the best hunting area in the world for moose. An epidemic in 1913 reportedly began the decline of the

population, though organized game hunting was also a factor. As to the initial rapid increase of the moose, there are various explanations. Increased hunting and trapping of the predator population (wolverine, bear and lynx) is one such possibility. An increase in the moose's effectual habitat may have occurred from a rash of forest fires either set by human hand or from geological activity.

One further explanation of the population decline of the moose concerns also the caribou (which have not been reported on the peninsula for some years). In the 1973 research, this author found a Ninilchik folk belief that before the rise in the moose population, the peninsula was occupied by caribou. Some villagers remember from the turn of the century hunting the few remaining caribou, having items of clothing (some of which survive) made from the hides. Legends suggest that the caribou come and go on the peninsula over wide periods of time, alternating with the moose.

The caribou and the moose do have some overlap in niche. If an interrelated fluctuation of ranges occur, it need not reflect competition or incompatibility between the two species. It could be the result of expansion of resources or of climate change and habitat alteration with one species unable to adapt. The herding behavior of the caribou or the "social" system of either species may also

explain such a phenomenon of long term variability.

The transitional nature of the Kenai Peninsula environment is repeatedly stressed in the preceding description. Detail is presented in the discussion of vegetation, climate, and fauna such that a sense of the complexity of evidence, and the level of the phenomenon is understood. One other important species interacts within this environment, man. How human adaptation affects and is affected by such a transitional environment is the question that began this research. This specific environmental setting will be returned to as an example of the application of ecological models.

Interactions during the period of historic contact unbalanced the ecological system in this environment. The culture change affected not only human populations, but also major animal populations. The problem of human adaption in a transitional environment is best addressed in terms of a more stable situation, perhaps the prehistoric occupation. However, an overview of the historic period is important to outline the nature of culture and ecological change, to indicate difficulties in reconstructing the prehistoric system, and to characterize sources that contribute to an early ethnography of the peninsula.

The Historic Period

Records from Bering and Cherikov's 1741 expeditions are the earliest documents from southern Alaska. These reports do not describe the Kenai Peninsula directly for neither vessel of the expedition approached Cook Inlet, and the head of the scientific corps, Delisle, died before the boats returned, as did Captain Bering. A naturalist, Steller, who sailed on Bering's ship, though imprisoned upon his return to Siberia, wrote some scientific reports (Golder, 1922-25; Van Stone, 1959).

The limited scientific information and the tales of the survivors of the Bering expedition were received as news of great riches. Siberian hunters and traders launched their crude vessels to exploit the new frontier. The Eskimo, Aleut, and Indian populations of southern Alaska were rapidly drafted (by force or fear) into the fur trade of several competing companies.

During the final quarter of the eighteenth century, explorers from many nations came to the southern coast of Alaska. Their main purpose was to search for a northwest passage. Captain Cook, 1776-1780, was the first to survey the shoreline of Cook Inlet (Cook, 1785). The last major voyage in search of the passage was made by Vancouver in 1792. As a response to these explorations, Russia strengthened her claim to Alaska by establishing more permanent settlements.

From historic records, it is fairly clear that the initial settlement on the Kenai Peninsula was formed as part of the fur trade. Shelikov, in 1783, began the first Russian settlement in Alaska on Kodiak, a large island 100 miles southwest of the peninsula. His fur trade company then established two posts on the Kenai Peninsula: one, Fort Saint George, at the mouth of the Kasilof River in 1776, and another in 1791, Fort Saint Nicholas, at the mouth of the Kenai River. In 1799, that company was granted a monopoly of the fur trade and became the Russian American Company with Baranov both the manager and first governor of the territory. Recognizing the value of acculturating the natives of his employment, Shelikov supported a mission of the Russian Orthodox Church. The mission served the peninsula first from Kodiak and then from Fort Saint Nicholas.

Various explanations have been offered as to the establishment of other communities. Khlebrnikov (1973) writes of the shipwreck of the Russian brig "Catherine" whose survivors may have established a colony, intermarrying with the natives. Another source of population is exiles from Siberia (Langsdorff, 1813 (II):64; Lisianski, 1968:215). Retirees from the Russian American Company, either unable or unwilling to return to Russia, formed settlements (Petroff, 1884). Mutineers from various ships and members of persecuted religious sects

from Siberia may have formed other settlements. An attempt was made to establish an agricultural colony by the Russian Crown. The actual success and location of this colony is unknown, though small Siberian cattle were kept in the settlements until late in the nineteenth century. The Russian American Company participated in the relocation of Eskimo and Indian populations to control native hostilities and to benefit the fur trade. The traders coerced formerly economically self-sufficient native families and communities to separate. This caused dependence for subsistence and survival upon, and assured employment of natives in the trade system.

The settlements which developed during the nineteenth century on the Kenai Peninsula were detailed in accounts of the Russian Orthodox priests. Fort Saint Nicholas eventually became the village of Kenai. Across the Kenai River another village, Chernila, was located. Chiktuk was up the Kenai River. Skilakh village was further inland on the shore of Skilak Lake. To the south of Kenai, both Ninilchik and Anchor Point were coastal settlements. Alexandrovsk, also a trading post, was on the southern tip of the peninsula. The population of these settlements was primarily Tanaina Indians or Creoles (mixed ancestry of Russian and either Indian or Eskimo). One Eskimo village, Akhmylik, was also described to be on the southern shore of the peninsula. Epidemics of measles

and tuberculosis, and the economic adjustment in the fur trade (starvation) decreased the size of the population on the peninsula. The reported high percentage of Russians and Creoles was probably due to the pressure to claim an alliance with the prestigious Russian population. Settlements were located on rivers or the coast for transportation purposes and because of dependence on salmon (J. B. Townsend, 1974).

The major ethnographic sources for the early historic period are written in Russian. Some of these have been translated (Bearne, 1976; Black, 1977; Davydov, 1810-1812; Risher, 1971; Khlebrnikov, 1973, Sarychev, 1806; Tikhmenev, 1861-1863; J. B. Townsend, 1974; VanStone, 1973; and Von Wrangell, 1970). Material that has been only summarily examined from this period is located in the Alaska Russian Church Archives and the Yudin Collection, both located in the Library of Congress, and in the Archives of the Russian Orthodox Church, St. Herman Pastoral School, Kodiak (Black, 1977). The Russian works reflected the bias of the Russian American Company or the individual missionaries and did not emphasize ethnography. Journals and logs from the various expeditions are another source of information (Dixon, 1789; Langsdorff, 1817).

The early sources document three native population groups in southern Alaska: Indians, Aleuts, and Eskimo. The Kenai Peninsula is described as having been occupied

by all three groups. The tendency for the Russians to describe the Pacific Eskimo as Aleuts may mistakenly place the Aleuts on the peninsula. Exactly which Pacific Eskimo group occupied the southern shores of the peninsula is still an obscured matter. That the population was early and drastically affected by the fur trade seems evident. A rather complete knowledge of the peninsula and its settlements is indicated not only in the descriptions, but in Tebenkof's Atlas (1852) of Russian America.

Acculturation during the early historic period can be traced to two important spheres of influence. The fur trade interrupted economic activities. The program of missionization reshaped religious practices and beliefs. Changes wrought by these two imposed institutions are echoed in the entire life systems of the populations of the Kenai Peninsula.

A variety of resources were exploited on the Kenai Peninsula as the Alaskan territory was explored. A few settlers tried placer gold mining in the Kenai River in 1850. Others mined coal at Port Graham (1854) to supply the Russian steamers. The United States secured the administration of Alaska in 1867, and the Alaska Commercial Company gained control over the Russian fur trade establishment (Bancroft, 1960). In 1889, an unsuccessful attempt was made to develop a lignitic coal industry on Kachemak Bay for export. The gold rush of 1890 was the

first factor responsible for a marked population increase. That increase continued with the construction of the Alaskan Northern Railway between the new settlements of Seward and Anchorage. The population of the peninsula was doubled by the addition of 1500 people in Seward at the turn of the twentieth century. At that time it is estimated that out of the total peninsula population, 400 were natives (Bennett, 1918).

The commercial fishing industry developed early in the twentieth century and attracted seasonal labor. This occupation slowly replaced fur trapping as the major source of supplementary subsistence. Another occupation, fox farming, was successful in the 1920s. Those villagers in Ninilchik who remember the fox farming state that not only the decline in fur prices, but the unpleasantness of the occupation, finished the industry. These were only secondary means of survival. Until the late 1940s, the majority of the population subsisted primarily by hunting and fishing.

In the 1940s, a major change occurred on the peninsula. A road was built connecting the Turnagain Arm area (already connected by road to Anchorage) and all of the major settlements on the peninsula to Homer, on the northern side of the mouth of Kachemak Bay. This brought an influx of homesteaders from the "lower 48." The gradual urbanization of the original settlements began and new

settlements at strategic spots on the road (including Soldatna with a 1973 population near 3000) were established. Such rapid development was recently accelerated by the construction of the "Alaskan Pipeline." The Kenai Peninsula is currently one of the most rapidly growing regions in Alaska.

This thesis evolved from the 1973 project to reconstruct settlement and subsistence pattern as a base of the historic acculturation. During the historic period through 1940, the major food resources exploited by the Kenai Peninsula population appear to have remained the same; salmon and moose or caribou. An exception to this generalization was the virtual elimination of the maritime hunting Eskimo population. The sustained exploitation of major food resources was the result of the successful reorganization of native subsistence strategy under the influence of the Russian Orthodox Church and the Russian American Company. To understand the acculturated system, a reconstruction of the pre-contact settlement and subsistence pattern was necessary.

During the historic period, the local transitional characteristics of the Kenai Peninsula were subordinated to a larger system of change. The development of Alaska as a territory of Russia and then the United States resulted in an unbalanced regional ecology. Communities of human population were rearranged and destroyed. New

populations and strategies for resource exploitation were introduced. The effect of the transitional environment on populations is overshadowed by the complex of historic change. The pre-contact ecological system of the Kenai Peninsula is examined in this thesis as an example interaction evidenced by human subsistence and settlement patterns in a transitional environment.

The Prehistoric Cultures

The prehistoric cultures of the Kenai Peninsula are not well known. As already stated, the historic ethnography indicates that the peninsula was occupied by at least two distinct groups, one Eskimo, the other Indian. In examining the prehistoric cultures of the area, researchers have been interested in the migration of populations (Dumond; Reger) in the diffusion of ideas and culture traits (Chard; De Laguna), or in the internal development of culture (Laughlin; Aigner). These vantages are chosen to explain the variety of cultures and the distinction between cultures.

In archaeological research, particular emphasis depends on the researcher's perception of the Eskimo-Indian relationship. Some determine the cultural affinity of sites based on the historic occupation of the area by Tanaina Indians (Kent et al., 1964). Others assume that the Tanaina recently (just prior to historical contact)

moved into the region after the Eskimo abandoned the area (De Laguna, 1934; Reger, 1973; VanStone and Townsend, 1970). Some evidence of the recent entrance of the Tanaina into the area has been assembled from sites north of the peninsula though still on Cook Inlet. Spaulding (1967) found Athabaskan (the larger Indian group to which the Tanaina belong) houses constructed on older Eskimo dwellings. Dumond and Mace (1968) demonstrated early seasonal Eskimo use of Knik Arm until 1000 and maybe as late as 1700 A.D.

It is difficult to distinguish between the cultural affinities of Eskimo and Indian occupation sites. VanStone and Townsend (1970) found this also to be the case on the nearby Alaskan Peninsula. Dumond et al. had similar difficulty distinguishing between Aleut and Eskimo sites on the Alaska Peninsula. They concluded "that it is a mistake to expect to find that any material cultural boundary between Eskimos and Aleuts has ever been as sharp as the cleavage between their languages" (1975:58). These difficulties tend to support a continuum in material culture despite known linguistic and socio-cultural differences.

Cultural determination of prehistoric sites is hampered by the often meager assemblages at sites. That sites are associated with seasonal subsistence activities is a further complicating factor. A seasonal site of one

population may be defined as a distinct cultural site because it is different from the same group's sites that are occupied during another season. On the Kenai Peninsula, Indian culture is associated with interior, northern sites and Eskimo culture with coastal, southern sites. This corresponds with the transitional characteristics of the environment in the region.

The major archaelogical study on the Kenai Peninsula was De Laguna's classic work (1934). That defined a prehistoric culture sequence for Kachemak Bay on the southwest shore and surveyed the western coast of the peninsula. She concluded that the Kachemak sequence was a generalized Eskimo type with elements common both to Arctic and northern Pacific cultures, though distinct from both. She found early occupations to be more clearly Eskimo while later occupations had Indian and Asiatic components. She suggested that diffusion explained the similarities of cultures along the Pacific Coast. Her survey of sites on the western coast of the peninsula, north of Anchor Point, described Tanaina sites. This began the assumption made by later researchers that Eskimo sites would only be found in the south. Actually, the difficulties of surveying by boat and dependence on local informants greatly biased her brief survey. There is much contrast between her coastal survey and the rigorous Kachemak Bay excavation and analysis.

In a later work with others, De Laguna et al. placed the Kachemak Bay culture in perspective with the larger region.

> We seem therefore, to be dealing with a North Pacific province where the cultural lines between the Aleut-Pacific Eskimo and Eyak-Yakutat are much less sharply drawn than are linguistic boundaries. In defining such a cultural province, we should not forget the strong ties between the Eskimo of Kachemak Bay and Prince William Sound with the adjacent Athabaskans, as well as those already cited that link the Eyak, Yakutat, and Tlingit with their interior neighbors. (1964:209-210)

Others have examined the Kachemak Bay sites since De Laguna's excavation and confirmed her conclusions. New sites in the Kachemak cultural tradition have been located (Hosley, 1968; Lobdell and Workman, 1976; Marsh, 1956; Reger, 1974). Smith in 1961 sent De Laguna artifacts from a site that appear to predate the Kachemak sequence (De Laguna, 1975a). In 1975, Reger found a ground slate artifact that suggests affiliation of the McHugh Creek site of Turnagain Arm with the Kachemak Bay material (De Laguna, 1975a). The single known inland Eskimo site, found near Kenai, is described and analyzed by Reger (1973).

The remainder of the Kenai Peninsula has been only partially surveyed. Kent et al. conducted a salvage survey preceding construction of a pipeline south of Kenai. The project assumed that settlement remains would be Athabaskan, reflecting the historic population. Though

De Laguna is referenced, her conclusion of Pacific Eskimo settlement of part of the peninsula is ignored. In the Kent et al. model of Tanaina subsistence which follows, this author finds both error and an interesting summary of current inhabitants' attitudes and assumptions.

> Most of the northern Athabaskan people depend primarily on fish and secondarily on land mammals. The Tanaina area, however, had sea mammals as well as an abundance of fish and land mammals. The distribution is not equal throughout the area, however, which results in groups of villages differing in this and dependent aspects of culture. The outstanding factor affecting the range of the food supply is correlated with salt water. In the Kachemak Bay area there is a regular salt water fauna, but in the narrower upper regions, the Inlet is apparently not suitable for many forms of sea life. One thus finds the rich food area in the lower Inlet, and areas gradually becoming poorer as one moves up the Inlet and inland until there was the familiar Athabaskan situation of a people who intermittently starve. (1960:104)

The findings of the salvage survey consist of several sites with house remains (20 x 20 ft. rectangular, semi-subterranean, reinforced with logs and built above ground) and sites of numerous unexplained depressions (circular and averaging eight to ten feet in diameter). The smaller depressions were grouped together and labeled "storage pits." When this author examined some of these "storage pits" in 1973, they were clustered with varied sizes and some had tunnel depressions. In one case a much larger pit (associated with smaller pits) had built-up sides, was lined with bark, and contained fire cracked rock. These "storage pits" may represent a different kind of site;

chronologically, seasonally, or culturally.

The site with historic Tanaina affiliations was excavated inland near Soldatna (Boraas and Workman, 1976). VanStone excavated a similar structure near Ninilchik (De Laguna, 1975a). Dumond (1968a) surveyed a section of the peninsula and found Athabaskan house ruins. After the 1964 Alaskan earthquake, the coast was surveyed to determine exposure of unknown sites and condition of known sites (Morgan, 1965). Several of the Kachemak Bay sites were destroyed by the earthquake.

General questions about the prehistoric culture of the Kenai Peninsula have been raised in previous research. What is the antiquity of the occupation? To what extent was the peninsula settled? How can the Indian or Eskimo cultural affinities of sites be assessed? To what larger area of cultural tradition does evidence belong? The analysis of evidence for answers to these questions has provided a general picture of the situation.

De Laguna estimates that phase I of the cultural sequence of Kachemak Bay dates from between 4000 and 3000 B.C., based on a comparison of evidence of cultural sequences in nearby regions. This culture evolves into three other discernible phases: phase II beginning approximately 2200 B.C., phase III beginning 80 B.C., and phase IV from 900 A.D. until the historic period. The Kachemak Bay sequence and the other distinct (though

comparable) sequences of the Kodiak-Afognaks Islands and the Alaskan Peninsula are "local variants of an ancient North Pacific 'co-tradition'" (De Laguna, 1975a:x-xi). These local variants appear to be associated with a particular region, to emphasize unique subsistence patterns, and from the historic and linguistic evidence, to speak different dialects if not distinct languages. The range of settlement of the Kenai Peninsula by the Pacific Eskimo has not been adequately examined.

A finding that may have relevance for the Kenai Peninsula derives from the interpretation of the Kodiak prehistoric sequence. D. W. Clark (1966, 1970, 1975, etc.) interprets a hiatus in the last prehistoric phase just prior to historic cultural contact. This could be related to a regional population fluctuation including movement of the Tanaina onto the Kenai Peninsula. It should be stressed that De Laguna sees the last prehistoric Kodiak phase, Koniag, to correspond with the last Kachemak Bay phase (De Laguna, 1975a:x).

The period when the Tanaina Indians first settled on the peninsula is not as well known. The Athabaskans are thought to have entered the coastal regions of south-central Alaska after 1000 A.D. However, ethnography of the Tanaina is better understood than that of Pacific Eskimo groups (Osgood, 1937; J. B. Townsend, 1974; VanStone and Townsend, 1970; Von Wrangell, 1970). The

specific adaptations of each culture will be described and examined in the context of the models of subsistence and settlement pattern.

The prehistoric cultures of greater southern Alaska are considered in relation to several general anthropological issues. There is debate about correspondence of archaeological remains with language groups (Eskimo, Aleut, Athabaskan, or their predecessors), and the application of glotto-chronological dates. Explanations of the occurrence of Asiatic and American traits in the cultural complexes are attempted. An understanding of the influences of different cultures upon each other and their distinctions is desired. The chronological ordering of developments is sought.

Questions about the prehistoric occupation of the Kenai Peninsula need solutions. The geographical and temporal range of occupation by different cultures is not clearly known. Did Tanaina and Eskimo groups inhabit the peninsula at the same time? If so, what was their relationship (trade, war, cooperation, boundary, buffer zone)? If they did not occupy the Kenai Peninsula at the same time, why not (climate shift, depletion of resources, long range movement of caribou)?

The first possibility, that both Indian and Eskimo populations inhabited the peninsula during the same period, is addressed in this thesis. Understanding the possible

interaction between populations contributes a larger question of the movement and development of cultural traits. Such is an inquiry into the process of interaction between cultures.

Summary

From a series of observations, this thesis problem originated. The Kenai Peninsula is an environmentally transitional region as evidenced by a complex of factors. In trying to understand the patterns of historic acculturation for populations in this region, the prehistoric cultural occupation was researched. The prehistoric settlement pattern and distribution, and subsistence relationships for the peninsula were found only in rough outline. Two cultural populations did occupy the peninsula prehistorically. What were the interrelationships between the Tanaina Indian and Eskimo population on the Kenai Peninsula? If they did occupy the peninsula during the same period, did the transition between two ecological communities affect those interrelationships? Can patterns of subsistence and resource exploitation within the transitional region describe the form of interrelationship? To find generalized explanations to these specific questions, an initial step is the review of ecological and anthropological sources.

The problem addressed in this thesis is the

prediction of interaction between distinct cultural populations in a transitional environment. The strategy of this thesis is to develop generalized models of interaction between cultures, that employ data about settlement distribution and exploitation of resources. The specific application of these models to a transitional environment will be considered.

ECOLOGICAL CONCEPTS

The position is taken here that human cultures are part of a larger life system. Concepts developed by ecologists, whose research is about the interrelations of organisms with their environments, are used as a framework for this study of interactions. A review of some ecological concepts pertinent to this thesis follows. The problem of using ecological concepts in the study of culture is discussed. The concepts of niche, habitat, and ecotope are introduced. The ramifications of ecotone as a theoretical construct are presented. The ecological method of studying population interaction is explored.

Culture and Ecology

There is a fundamental difficulty in the application of ecological theory to human research. Two extremes are taken by ecologists in considering the human element; either ignoring it and inquiring into the "natural" ecological setting before man's interference, or looking at the net effect of the extreme level of organization, industrialized society (Bennett, 1976). One might think it impossible to conceive of man in harmony with nature.

Man is seen as such an effective element that his actions oppose rather than coordinate with the life system. It is possible to subordinate the importance of man to the level of being an integral part of a natural system. (See Bennett, 1976, for discussion of ecological theory in anthropology, Odom, 1975).

The characteristic of human populations that distinguishes them from the biological world is culture. Culture is variously described as the "ultimate in adaptive strategies." It allows populations to modify themselves and their conception of the environment to the extent of satisfying organism needs by controlling the blood of the life system, energy. Culture so affects the role of human populations in the life system, that its variations define populations (i.e., culture groups).

This differentiation of culture populations within the human species, makes comparisons between human populations and other life forms difficult. Historical principles and generalizations in biology are based on species. Current biological research recognizes "breeding populations," the results of which should be applicable to the study of culture populations. The difficulty is whether to interpret and analyze interactions of human populations at the biological level of community or the level of population. Options exist to consider human cultures as components of the species population or as

analogous to separate species in a community. Realistically, generalizations from both levels of biological research apply (Odum, 1975).

Niche, Habitat, and Ecotope

The concepts of niche, habitat, and ecotope are fundamental in understanding a population's association with the ecological system. These concepts are historically reviewed and refined by Whittaker et al. Their definitions are: niche--"the role of the species within the community," habitat--"distributional response to inter-community factors," and ecotope--"the full range of adaptation to external factors of both niche and habitat" (Whittaker et al., 1973:326).

The definition of niche is functional; that of habitat is spatial. Niche is what can be done; habitat is where it can be done; and ecotope is what is done. Ecotope, as a concept, integrates niche and habitat. The ecotope is the adaptation of a population to the environment.

Whittaker et al. (1973) present an organizational scheme of variables to consider in defining a population's ecotope. The inter-community variables are those that spatially define the effect on the population of the environment. They suggest specific variables of elevation, soil moisture, etc. (In human populations,

pertinent variables are the availability of water, distribution of food sources, etc.) Intra-community variables are those describing the specific role of the population in the community (i.e., seasonal limitations, relative amount and kinds of resources exploited). (Seasonal subsistence activities, and percentages of plant, game, and fish consumed are two variables describing the ecological function of human populations.) The variables of population response to the environmental community are density, frequency of utilization, etc. (Variables defining human population adaptation are settlement density and distribution, and population size and structure.)

The comparison of the ecotope of two cultural populations in the same regional environment reveals where and how they adjust to each other's presence. With an overlap of niche and habitat of the populations there is the possibility of interaction between the populations. The definition and comparison of ecotope is the basis for an understanding of interaction between populations.

The Ecotone

It is important to relate the ecological setting in which populations interact. A conceptual framework is needed to describe the environment that affects and is affected by populations.

Ecologists study several levels of organization in assessing the organisms' relations with the environment. Examples of these levels range from individuals, to populations, and to communities. The associations of populations in a given area are communities. The concept of community leads to an understanding of the biotic zones. A biotic zone is a region displaying a distinct assemblage of organisms. Such a community associated with particular abiotic conditions (climate, soils, minerals, etc.) is an ecological zone. Various classification systems of world biological communities have resulted from the zone concept.

These principles of biotic and ecological zone are useful in examining directional change in an area (specifically through succession) and in predicting inter-species relations and associations. There is debate as to the existence of distinct zones. It is difficult to define boundaries of either biotic and ecological zones or of communities. Many ecologists contend instead that there is a continuum of gradual change of ecological association in space and time (Curtis, 1955; Curtis and McIntosh, 1951; Whittaker, 1970).

The abstract nature of the concept of community or zone association must be accepted. In order to compare and describe the natural world it is necessary to separate the continuum of life into some discernible units. The

use of biotic zones and communities as a typological tool by ecologists in their research has been enlightening. The concepts have provided a particularly valuable view in quantitative studies of area communities, succession and migration analysis, and in comparisons of density (Knight, 1965).

The difficulty in applying the concept of zone to a real situation is the lack of distinct boundary of any given zone. The concept of "ecotone" is a partial solution to this difficulty. Ecotone is defined as "a transition area between two adjacent ecological communities usually exhibiting competition between organisms common to both" (Webster, 1973).

> In nature, there is never discernible a sharp line or point indicating the beginning of one community and the end of another; instead there is a zone of transition, or tension, in which the conditions for each of the adjacent communities becomes more adverse and there is often an intermingling of species from both communities. Such a region is known as an ecotone or tension zone. (Knight, 1965:249)

Those who contend that there is no real boundary between ecological zones will also fail to find boundaries of the ecotone. As an idea, ecotone describes a transitional area. Some phenomena are attributed to ecotones. The greater variety of species in the transitional area is called edge effect. Some edge species may be particularly adapted to a transitional zone and exhibit a greater density within the ecotone than within the more

distinct neighboring zones. There is a tendency for populations from adjacent zones to temporarily occupy the edge area and then retreat to the original zone; i.e., maintain a seasonal edge preference (Knight, 1965; Odum, 1975).

Recently Rhoades criticized the use of the concept of ecotone by archaeologists (1978). He primarily finds fault in misuse of the edge effect phenomena, as applied in outdated wildlife studies of game animals. He makes an important point that an edge effect may not be relevant to human populations. It is important to note that a larger biomass of a greater total population (per unit area) in the transitional zone does not necessarily result from an edge effect (a large variety of species) or the existence of an edge species (particularly adapted to the area and densely distributed) (nash, 1975).

Rhoades makes the same error of misusing ecological concepts that he identifies in the works of others, when he states, "Edge effect is a very general term designating the tendency toward increased species variety and density between two biotic communities where some species, not all, from adjacent communities intermingle with strictly edge constituents" (1978:611). He combines what are actually separate and not necessarily associated phenomena. Edge effect is a general term meaning the tendency toward increased species variety. Increased density is

exhibited only by edge species particularly adapted to the ecotone not, as implied, by all species in the edge area. Additionally, some species practice a seasonal edge preference in the transitional area, while other species do not survive in the marginal conditions of the ecotone. The ecotone is a useful concept to examine the transition area between two ecological zones or communities.

Ecotone is a concept that like ecological zone can be applied at various levels. These include the transition between such macro-zones as forest and ocean, or the margin separating two forest types, or the edge micro-zones of soil and tree root. These concepts of ecological zone and ecotone are not meant to describe reality, but to organize reality so that it can be better understood. They are used as a framework to describe the environment that affects and is affected by populations.

It is desirable to compare cultural population interactions within transitional areas with the patterns observed for other species in the ecotone. Cultural populations may utilize edge species and the edge effect. An ecotone might be found to serve as a transitional zone or boundary between cultural populations associated with the larger ecological communities.

Population Interaction

Within an environment, populations are perpetually interacting. Two conflicting needs of organisms and populations can be identified; to survive, and to cooperate. It is in balancing the fulfillment of these needs that population interaction takes place (Allee, 1951).

Slobodkin (1961) abstractly derives a picture for the coexistence of populations. Typically, groups compete for a portion of the resources of the habitat. One population may serve as a resource for the other. The populations may mutually benefit each other, or the populations may be independent.

The above organization is refined in Odum (1975). He views interactions as negative and positive. Competition, parasitism, and predation are the negative patterns. The positive interactions are commensalism--one population benefiting with the other unaffected, proto-cooperation--both benefiting with the relationship not necessary for survival, and mutualism--an association necessary for the survival of both groups. Neutralism--the independence of populations can be added to the scheme. Each of these types of population interaction is discussed below.

Much attention is given by ecologists to the phenomenon of competition. Gause's principle, or competitive exclusion, is the basis for ecological discussion.

The tenet is that no two species (or populations) with the same niche can coexist within one ecosystem. The competition between two groups results in either elimination of one group or modification of the niche (or ecotope; considering that the space of the system could be divided and a boundary established).

A different order of competition is identified by Park (1954) in a study of flour beetles. He labels this form of competition "interference." It occurs when the coexistence of two populations in the same habitat modifies their behavior though they are not competing for food or space. In examining cultural populations, this seems a particularly significant idea.

Intra-specific competition is usually more intense than inter-specific because organisms are competing for virtually the same resources.

> As a species becomes increasingly "successful," its struggle ceased to be one of struggle with the physical environment or with other species and comes to be almost exclusively competition with its own kind. We call that species most successful that has made its own kind its worst enemy. Man enjoys this kind of success. Intra-specific competition may be as crude as cannibalism or infanticide, as "romantic" as chivalrous jousting or dueling, or as subtle as Stephan Potter's "one-upmanship," but it all has the same end in view; the securing of advantage to one's self at the expense of one's neighbor in a world that is not, and cannot be, large enough for the continuously "successful" species. No activity of man is without competitive uses. Even tact is a competitive weapon. (Hardin, 1966)

Niche diversification is a strategy for coexistence in a setting of competition. Species with a corresponding niche can exist in the same habitat by subtly differentiating their niche. They can exploit particular food resources in preference to a range of other possibilities, shift time period of exploitation (seasonally or daily), or limit the range in which the resources are exploited.

Competition between barnacle populations in an edge area was studied by Connell (1961). Natural resolution of competition involved stratifying the habitat. This niche reduction resulted in distinct strata (related to light penetration and temperature) of the two barnacle groups. Either group could exist in the conditions of either strata, though one group was not as successful in the darker waters.

In a situation analogous to competing human cultural populations, interesting observations have been made. Competition between populations of a single species (interbreeding populations distinguished by ecotope) results in population distinction approaching the variation of habitat. This functionally facilitates less competition between the populations in the area of range overlap. The primary example is of two nuthatch groups. Where their ranges overlap, bill length and head color are different. At the extremes of their respective ranges, they appear quite similar. The increase in

variation of the bill may be directly related to the kind of food eaten (Vaurie, 1975). Two competing non-interbreeding populations become more specialized at the poles of their ranges, the gene flow being restricted. The degree of specialization between two adjacent competing populations may reflect the quality of their interrelationship.

Patterns of interrelations found in competing populations for which there is much supporting evidence are generalized by Odum (1975).

> (1) Closely related organisms often do not occur in the same place; or if they do, close study shows that they use different energy sources, are active at different times of day, or at different seasons, or otherwise occupy a different niche. (2) Where a large number of related species is present in a region, the niche of each is often narrower than when only a few species are present. Comparison of islands and mainlands often illustrates this trend. (3) Related species often replace one another in a gradient. (Odum, 1975:134)

Interaction patterns of predation and parasitism are similar. They produce a negative rate of increase in one of the populations (the prey or hosts). The relationships are density dependent; removing old, young, or unfit organisms. Cycles of growth and decline in both populations or predator and prey (parasite and host) occur. If the predator population increases rapidly, then the prey population will decrease which will in turn decrease the predator population which will cause an increase in the prey population . . . and so on. The amplitude of this

oscillation over time can be quite great or hardly noticeable. Examples of this type of interrelationship between human groups are the instances of slavery and ritualized warfare.

Over a long period of association, mutualism may appear to be a relationship of predation and prey. The difference is that the existence of each population is necessary for the survival of both populations. The relationship is a mutually beneficial association.

Proto-cooperation, commensalism, and mutualism are positive interactions as they reinforce the balance and success of the entire community. Among human populations, trade and tribute systems are examples of these positive interactions. A relationship of proto-cooperation between two populations benefits both groups and is not necessary for the survival of either. In a relationship of commensalism, one population benefits from the other without damaging or benefiting the second group.

Neutralism is neither a positive or negative interaction; it is the lack of interaction. The balance and success of the ecological community is not affected. It implies the existence of a boundary or frontier between populations. A separation can be made of frontier and boundary as types of spatial segregation. "A frontier involves the process of integration of new areas into old (more developed) traditions, whereas the function of

boundaries is to separate regions along physical or conceptual lines" (Watson et al., 1971:100).

Within a defined environment, ecological interaction is studied to find (1) how the interrelationship contributes to the needs of individual populations to survive and cooperate, and (2) the negative, positive, or neutral effect of the interrelationship upon the larger community. The interrelationships are evaluated in terms of the benefit to populations. The contribution of the relationship to the populations' survival is analyzed. How the relationship affects the adaptation of the organism (as in ecotope specialization) and the long range cycle of growth and development of the community are appraised. Similarity and differentiation of the population and the number of interacting groups in comparison to the extent of ecotope are noted. A typology of interrelations is formulated. This is the technique used by ecologists for inquiry into the nature of interrelations between populations.

Summary

Ecological concepts that are elemental to this thesis have been reviewed. Relating cultural studies with biological data is difficult because of the tradltionally different focus of the studies. Cultural populations can be compared with biological patterns at various levels of

generalization. Interacting populations can be compared through a schema for defining ecotope. There is an organizational framework that is used by ecologists to describe and study the environmental setting of population interaction. The ecotone, a typological concept, describes transition areas. Ecologists have broken down population interaction phenomena into forms of behavior.

These ecological concepts are important to this thesis as they provide the foundation for modeling interaction. Determining the nature of interrelationships of culture populations involves investigating (1) how the interrelations contribute to the needs of the populations to survive and cooperate, (2) the effect of the relationship (positive, negative, or neutral) to the ecological community, (3) the benefit to individual populations, (4) the adjustment of ecotope and differentiation made by the populations, and (5) the overall nature of the interaction. The characterizations of competition, predation, parasitism, mutualism, commensalism, proto-cooperation, and neutralism organize types of interaction that can serve as models.

The object of this thesis is to predict how cultural populations might interact in an ecotone. The tactic is to develop models of interaction dependent upon ecotope.

To augment this application of ecological concepts toward the study of cultural population interaction prior anthropological use is surveyed.

ANTHROPOLOGICAL PERSPECTIVES

This thesis is a contribution to the anthropological study called "cultural ecology." J. W. Bennett suggests a broad definition of that school: "How and why humans use Nature, how they incorporate Nature into Society, and what they do to themselves, Nature, and Society in the process" (1976:3). Fitzhugh (1972:7) explains such an approach in his "environmental archaeology" monograph:

> One of the fundamental assumptions in relating man to his environment is that man is part of the ecosystem, that he cannot live without it, and that he is limited by the environment or by the extent of his ability to alter it. A second assumption is that culture can be analyzed as a superorganic system and that it is man's chief means of survival, resulting in successful adaptations in almost every conceivable portion of the globe. Culture is, therefore, an adaptive system which articulates with the environment through a complex set of patterned relationships. Following Struever (1968b:136), this occurs within two environmental milieus, one of which is bio-physical, the other social. Anthropological investigation of culture must therefore concern itself with both aspects of the environment.

In accordance, this thesis is concerned with both of these environmental facets.

As an investigation of human population interaction within a particular environment, definition of distinct population is implied. Culture is the element that

distinguishes groups symbolically, materially, and spatially. A population's patterned relationships indicate a system of adaptation to a social and biophysical environment. This thesis is concerned with the pattern of interaction between distinct cultural populations. Defining groups by cultural variables is typological though dynamic as elements change through invention and/or contact with the social and biophysical environments.

The relationship between cultural units and adaptive systems of resource use is an anthropological issue to which this thesis contributes. J. W. Bennett stated,

> This is the basic Stewardian problem: the extent to which cultural cores can be determinative of other institutions, or the extent to which cultural cores can themselves be shaped by these institutions. The techno-economic-ecological systems complex can become part of the definition of distinctive cultures, or it can transcend cultural boundaries, permitting new definitions of boundedness. (Bennett, 1976:308)

In examining a part, there should be an awareness of the edge which incorporates it into a larger system as both a boundary and a link. A culture is partially shaped by boundary and interaction with other cultures and the environment.

The concern here is about how a transitional environment affects cultural populations. It is assumed that to some extent the differentiation of culture groups will follow biological differentiation. An understanding of

the ways in which a culture group uses or is bounded by a transitional environment and then interacts with other cultural groups is sought. An organization of predictable forms of interaction between distinct cultural populations in an ecotone is the goal of this work.

The research of some anthropologists contributes to this modeling. The ecotone concept has been applied. Cultural population distinction and interaction has been examined. And ethnographic information pertinent to understanding group interaction in Alaska has been compiled. These anthropological perspectives are presented next.

The Use of Ecotone

The concept of ecotone is used in anthropology primarily in the reconstruction of cultural settings. Ethnography and socio-cultural studies generally describe the local environmental components that affect a cultural system. Their interest is not in the effect of the interrelations of larger biological communities on the system (J. W. Bennett, 1976:308). Archaeologists and ethno-historians reconstruct the environment as thoroughly as possible. Again the emphasis of the search is for a phenomenon in the reconstruction or description that serves as an agent in cultural behavior.

Hickerson (1965) reconstructs the relationship

between the Chippewa and the Sioux from 1780 to 1850. Competition for game, specifically deer, resulted in warfare between the two cultures. A buffer zone existed between the two groups which coincided with an ecotone between forest and park-land regions. Only war parties or well-armed hunting groups could safely trespass into the contested buffer zone. Warfare functioned to prevent the favorable game habitat from being occupied so intensively as to deplete the supply. The phenomenon of deer being an edge species was used to explain warfare. "The effect of warfare, then, was the regulation and preservation of a supply of deer in and near the buffer zone for the use of Indians" (Hickerson, 1965:62). The situation has been reviewed by Watrall (1976).

Several authors suggest that the biotic edge effect is echoed in human cultural diversity and density (Baerreis and Bryson, 1965; Cleland, 1966; Fitting, 1966a; Gumerman and Johnson, 1971; Gumerman et al., 1976). A more varied environment is viewed as a more favorable environment for man. In these instances the concept of ecotone is evoked in the formation of research strategy. Cultural occupations are examined by these authors in an environment assumed to be beneficial for dense and varied populations.

The concept of ecotone is also used to explain observations. For example, a shift in subsistence

strategy may be related to a high density of deer in an ecotone (Struever, 1968b; Wood and McMillan, 1972). Gorman (1972) concludes that mammoth kill sites and evidence of the Clovis culture appear to be related to ecotonal grass stands providing a variety of food for both man and beast.

Theories about the evolution of village life and agriculture are associated with the phenomenon of ecotones. A variety of species and high density leads to sedentary settlements and population expansion. The ecotonal environment provides a favorable habitat for weedy cultigens that become the seeds of human agriculture (Cooter, 1974; Glassow, 1972; Harris, 1969, 1972; Rhoades, 1974). Archaeologists theorize that the most favorable conditions for plant domestication existed in

> The marginal transition zones or ecotones between major ecosystems. Biological productivity tends to be high at both primary and secondary levels in these situations and they offer maximum variation in the availability of species. . . . (Here) it would have been easier than elsewhere to combine the cropping of animal protein by hunting herbivores or catching fish with the gathering of wild plants. The more assured and better balanced diet thus afforded would also have reinforced tendencies towards sedentary settlement. (Harris, 1969:8-9)

Thomas altered the meaning of edge effect to be the "exploitation of dual life zones" (1973:173). In this sense he referred to successful human subsistence patterns involving two biotic zones; i.e., the human population as

an edge species.

Nash (1975) used the concept most effectively in his regional archaeological research in northern Manitoba. Rather than applying the concept of transition area with its context of the ecotonal phenomena, he used the concept to frame his research. He described the environment of the region and noted the occurrence of two major biotic zones (forest and tundra) on the edges of the region. He identified this area as a transitional zone. Within the transitional zone, three lesser vegetation zones were found to be associated with different cultural sites: forest-tundra, transitional forest, and forest-border. Substantive conclusions were that each of these micro-environments contributed to the human exploitative pattern.

> It can be argued that the selection of sites was a complex process reflecting, at the highest level, the shifting emphasis within a caribou-fish subsistence economy, and at a lower level a concern for the location of eskers. Most sites in the region are small and not physiographically diverse (multi-factorial) locales. (Nash, 1975:177)

A review of Nash's (1975) conclusions about the process of culture in a transitional zone contrasts to the assumptions of others described above. He found continuity through time and minimal cultural evolution in a transitional zone. Settlement pattern and subsistence strategy change little; instead the cultural system

persisted in a stable equilibrium. The most significant change was an increase in population and a possible increase in functional specialization among sites. With a stable environment and a conservative culture, major change appeared to be unprofitable. The culture adapted to the transition zone. In this instance, greater variety of species affected settlement and subsistence pattern. Greater density of edge species appeared ineffectual in providing a resource to be intensively exploited.

Gumerman and Johnson (1971) suggest that further study of ecotonal habitation may lead to a better understanding of the nature of boundary between culture areas. They refer to the association of culture areas and biotic zones and their implied, associated boundaries.

This thesis proposes models of relations between cultures in the context of a transitional environment. Such a procedure is similar to Hickerson's (1965) approach in examining cultural interrelations and boundary in the transitional environment. Rather than attribute the phenomena of edge areas to the setting as did Hickerson, the occurrence of these phenomena are to be assayed for their influence on the human populations. The inquiry is in concordance with Gumerman and Johnson's (1971) supposition that analysis of ecotonal occupation may disclose the interrelations between cultures. Nash (1975) has documented a pattern of adaptation by one cultural

group to a transitional area between larger biotic zones. It is not assumed here that all transitional zones will exhibit the same edge area phenomena for human groups. The cultural variables of transition areas are dependent on the components of the larger ecological communities. This thesis presents alternative models of cultural population behavior with respect to transitional zones.

Population Distinction and Interaction

As expressed by Levi-Strauss, an aim of anthropology is totality.

> It regards social life as a system of which all the aspects are organically connected. It readily admits that, in order to acquire a more thorough knowledge of certain types of phenomena, it is essential to subdivide. . . . When the anthropologist endeavors to create models, it is always with the underlying motive of discovering a form that is common to the various manifestations of social life. (1967:362-363)

Anthropology begins with a description of the form of culture and then moves to an analysis of the ongoing process and dynamic change of the culture system. The advantages of this analysis of process as a step beyond observation of cultural entities are in the development of theories of relationship and the observation of similarities and regularities that allow the formation of predictive models and eventually general theory and principles (Clarke, 1968:22, 23).

Initially, a means of distinguishing cultural

populations is advanced here. Then patterns and forms of the interaction process of those distinct groups that have been considered are examined. Anthropologists have inevitably confronted the problem of boundary, identity, and role of cultures in a system. The concept of ecological niche serves as an organizing principle in the distinction of groups. Other discussion involves the concept of collective symbols and systems in cultures. The institutions of warfare, alliance, and trade are studied as instances of community interaction. Some relevant examples of these anthropological motifs follow. Discussion of the distinction of culture groups leads naturally to a consideration of the interaction of the populations.

Barth (1956) states that the culture area concept is usually applied in the analysis of culture distribution and form in the environment. Culture area is a scheme associating culture types with biological provinces. He perceives the environment of a group as not only defined by "natural conditions . . . but also by the presence and activities of other ethnic groups on which it depends. Each group exploits only a section of their total environment, and leaves large parts of it open for other groups to exploit" (1956:1079). This intertwining of cultural groups makes difficult the application of the culture area concept (in Asia particularly). In his work, Barth uses

ecological concepts to study distribution, "particularly the concept of a niche--the place of a group in the total environment in its relations to resources and competitors" (1956:1080).

Barth also generalized about the distribution of ethnic groups. The distribution of these groups does not follow regional areas, but rather the distribution of habitats exploitable by individual groups (niche). Different groups will occupy the same area if they exploit different resources and develop "symbiotic" relations (mutualism). If both groups compete for the same resources, the more powerful replaces the weaker. If different groups use the same resources but the weaker is able to utilize more marginal environments, they may co-reside. These are observations of interrelations in one region.

Love (1977) too has examined the concept of "ecological niche" in anthropology. He discusses the primary use of the concept in explaining of ethnic or sub-cultural groups in complex societies. He asserts that it also has utility for understanding the interaction between culture groups. He demonstrates this by applying the concept to the changing patterns of resource exploitation of two groups in northern California. He documents a process of competition for resources and the resulting adjustment of niche and the relocation of one group.

A culture group identifies itself with a portion of the environment.

> Not all the environment that surrounds a given society is consciously realized by its members; there is a neutral or indifferent part of their surroundings that does not affect the development of their social life because the cultural baggage of the moment does not contain the knowledge and tools necessary for its exploitation. On the other hand, there is another part of the environment composed of a series of elements considered to be subsistence resources, which taken together constitutes a "culturally integrated space"; the latter is an abstract idea of the environment in the collective mind of the group, which could be called the "cultural environment." It differs in populations that exist at the same period of time and, more logically, differs among those that are distant from each other in time, even though they may have occupied the same sites; this is true not only because of the changes that habitat could have undergone but also because of the different conceptions that made up the aboriginal thinking of the moment. (Martinez, 1979:313)

Reichel Dolmatoff in his ethnography Amazonian Cosmos (1971) is concerned with the individual's and society's perception of nature. He examines the symbolic perception of the environment in terms of stereotypes, images, and clusters of associated signs at different abstract levels. He views this perception as diffused throughout patterns, institutions, technologies, and economic and value systems. He describes a region occupied by several exogamous groups which are defined by their relations with the environment. The groups interact in a complex network of affinity and consanguinity. Different group settlements are associated with particular geographical features

and subsistence patterns. Ecologically, each distinct group occupies a diverse niche (or micro-niche in terms of the regional population). The habitats of the groups interdigitate within the region. In examining the populations' perceptions of the environment, he finds a central theme--man in both competition and symbiosis with animals of the ecological system.

Some archaeologists (Caldwell, 1964; Blanton, 1976) interpret the interaction between distinct cultural groups as mutually beneficial. They describe regional spheres of interaction in terms of economy. Regional networks arise from local interaction between cultures. A moderate degree of sedentary settlement by the social group is necessary for the establishment of local interaction networks.

Trigger discusses difficulties in distinguishing cultures and in understanding interaction.

> The simple truth is that while possession of a common material culture implies interaction and close ties among those who possess it, it does not necessarily imply that the bearers constitute a single linguistic, social, economic, or political unit. Social anthropologists, moreover, are keenly aware that the boundaries of social, political, and economic ties may be as amorphous and interclined with those of other systems as are the boundaries of cultural traits. (1967:151)

Trigger proposes that the study of social, political, and economic relationships using archaeological data be called "settlement archaeology." He suggests three units

of analysis for this research; the structure, the settlement, and their distribution. He postulates that a study of

> the spatial relationships between different communities may reveal something about ecological and political arrangements. Some communities may be shown to be dependent, either economically or politically, on other communities. The settlement of economically marginal regions may be related to the development of mining or trade, and the avoidance of certain areas may reflect the relationships between different political groups. (1967:152)

As an example of the settlement method, Trigger examines warfare between the Huron and their neighbors. Based on ethnography he sees the interaction constructed upon values of prestige, revenge, and sacrifice. He reviews three functional explanations of the warfare. The psychological explanation is derived from the Tupinamba of Brazil. A great need for harmony existed among members of crowded villages. Hostility and aggression were expressed against members of other bands by warfare and torture. The economic explanation is a changing economic role and the division of labor between sexes, with the men seeking prestige from warfare as their contribution to subsistence diminished. The demographic explanation is that a shortage of suitable soil resulted in population pressure and competition. He did not find clear correlations between the settlement data and these explanations or the political organization. He did find

a "correlation between larger communities, denser concentrations of villages, and the growth of increasingly elaborate fortifications and cannibalistic practices" (1967:158).

Others have examined the phenomenon of warfare as cultural interaction (Fried et al., 1968). Chagnon (1968) drew interesting conclusions about warfare among the Yanomamo. He believes that the motive for war is not territorial, but a demonstration of sovereignty and autonomy by force and aggressiveness. Further, the political sovereignty of a group is improved by entering into alliances or emphasizing military capacity. Smaller groups are more likely to enter into an alliance.

Population Interaction in Alaska

The nature of conflict and alliance in northern Alaska was analyzed by Burch and Correll. Their conclusions amplify those of Chagnon. They emphasize the simultaneity of positive alliance and intense mutual hostility. They use the term alliance in the liberal sense to refer to any relation that associates individuals or organizations. The organization of the northern Alaska populations is described as being a division of space and population into regional groups. Members of a group spoke a distinct dialect that identified them to strangers. An individual had a knowledge of detailed

dialect differences and could choose which dialect to speak for the occasion. A group would be identified with a home region. The entire membership might be absent from the "home" range while being occupied with seasonal subsistence. A region would have a yearly cycle of subsistence distinct from its neighboring region. The group membership vaguely defined the marriage universe. Marriage rules did not exist except in a pattern of contact and familiarity. "Each group thus constituted a 'deme' in that it was a partially isolated population of individuals having an intimate temporal and spatial relationship to one another" (1971:24).

Boundaries between these regional groups were territorial, linguistic, and social. It was important to have alliances across regional boundaries. A "stranger," a threat to one's existence, was either avoided, killed, or enslaved. With nomadic hunting patterns, fluctuating food sources and/or feuding within a region, a group might have to move to another region to avoid starvation or murder. Alliances with members of different regional groups were important.

Alliances were relations between individuals. Individuals' relationships between regions benefited many people as they involved the network of alliances of each individual's group. Two types of inter-regional alliances were considered; the common trade partnership and the

stronger bond of intermarriage. Trade partnerships were functionally diffuse relationships of obligation for mutual protection and support. The element of trade was often symbolic. "Partnerships were more significant as alliances per se than they were specialized foci for exchanging goods" (Burch and Correll, 1971:26).

Burch and Correll emphasized that the trade partnerships did not occur simply as a mechanism to intersect ecological zones. That is, they were not simply a network of trade of caribou skins and furs from the interior for sea mammal products from the coast. The regional alliance network crossed major linguistic, social, and ecological boundaries. Athabaskan groups were incorporated in the regional system.

For the Eskimo groups intermarriage was of two types. Burch and Correll label these types as residential and co-marriage (non-residential spouse exchange). "Intermarriage between Eskimo and Athabaskan groups followed Eskimo marriage rules" (1971:26-28). This may reflect an Eskimo lack of understanding of the Athabaskan marriage rules and an avoidance of the bride price obligation.

Both mechanisms of alliance increased the adaptation of the groups to the regional system in times of warfare and famine. The alliances functioned to allow safe interregional movement of groups. A messenger might be sent to invite allies to a late fall or winter feast. These

invitational feasts assembled large numbers of individuals (all allied to the host, but not necessarily to each other) for friendly interaction to reaffirm the alliance and solidarity, in addition to the redistribution of goods. A second type of trade fair or market (by general announcement) was usually held in the summer on the coast because of food requirements. These fairs might be held in another season or location if there was an exceptional abundance of food resources. Inter-regional migration occurred at a low level. An individual might leave his group to intermarry, escape feud or famine, or in fear of a shaman.

Inter-regional contact accentuated conflict. Personal insult or injury, defeat in games at fairs, being surpassed in trade, murder of an ally, abduction of wife or sister, or theft, all might lead to warfare. Burch and Correll found that conflict and inter-regional alliance vary directly not inversely. "Groups that fight one another stick together" (1971:35).

Hostility between groups might last a few months to a few years. Since fighting was a one-to-one action, population size was important. Smaller groups would ally against larger ones for retaliation and defense. The object of the warfare was not to gain territory or property, but to annihilate the group. Conflict within a regional group (feud) was differentiated from that between

groups (warfare). Warfare might involve ten allied men on a side, even though only one man or a family might be feuding with another. Warfare involved direct action and ambush while feuding was performed discretely and resulted in murder. A ritual was necessary in the disposal of the murdered body, but no ritual was needed in warfare.

Burch and Correll (1971) found that this network of inter-regional alliance and warfare crossed linguistic boundaries (between Indian and Eskimo) and geographical boundaries (coast and inland, or north slope and south slope). They surmised that material culture reflected these regional interactions. The work of A. M. Clark (1970), an archaeologist, supported their linguistic and social-anthropological conclusions. "With respect to Indian-Eskimo relations in North Alaska, then, the answer to the question, 'Intermarriage, trading, or war?' is simply 'Yes!'" (Burch and Correll, 1971:19).

Associations and alliances in Eskimo society provide adaptive flexibility in the operation of the community both socially and ecologically. A more specific list of these relations found in Eskimo culture can be detailed. Relations extending kinship are adoption, betrothal, namesake, and spouse-exchange. Relationships not extending kinship are serious and joking partnerships, feasts and trade fairs, meat sharing, dancing, singing, wrestling partnerships, amulet relationships, ritual sponsorship,

and work and hunting associations. "Alliance is symptomatic of the essentially negotiable character of all social relations in Eskimo Society" (Guemple, 1971:5). Alliance incorporates strangers into the group. Even "kinsmen are not, in Eskimo thinking, irrevocably bound into networks of mandatory social connection where no discretion is possible. Instead, every man is at liberty to make his own way in the social world" (Guemple, 1971:7).

Slobodin (1960) discusses patterns of warfare between Eskimo and Indians.

> Although captives and loot were a part of these raids, the main cause of war was revenge. A result of these hostilities was a neutral ground where neither group felt safe and which was left uninhabited. Neither group the Kutchin or Eskimo were attempting to expand their territories by these war raids, before or during the fur trade. A similar pattern of traditional hostilities existed between the Chipewyan and the Eskimo of Hudson Bay and Coronation Gulf. There was a neutral land established between these two groups and also a similar situation of an increase in conflicts during a short period when the Chipewyan felt their superiority from direct involvement in the fur trade. (1960:361)

Another system that insures that an individual will meet a kinsman or partner in any region he visits is described by De Laguna.

> Western Athabaskan economy is based upon the ability to exploit all the available micro-environments in short distances that separate lake, river, marsh, and mountain, and the social organization is adjusted to facilitate the movement of individual families, not only within the territory of their own band, but to caribou fences, sheep

> licks, or fishing places in any area where they can join a relative. A sib system which permits the equation of lineages across band or even dialectical "tribal" boundaries is, however, an ideal way of insuring the presence of kinsmen and partners where one travels and thereby widens the possible areas a hunter can exploit. (1975b:136)

A small local group is the sib (a group associated by claimed descent from an ancestor) or sub-sib among the western Athabaskans "because exogamous marriages are necessary and profitable" (1975b:137). The sib is associated with a residence (or residence of its leader) and named for an animal or other important resource or possession. The sibs are aligned into moieties because of a consistent marriage pattern. The moiety system is fluid, not a fixed association of opposite sibs, so as to adjust for changes in sib populations in specific regions. If an individual moved into another region he would come into contact with members of another regional group belonging to his sib.

In addition to the system of matrilineal descent of the Northwestern Athabaskans linking individuals through regional boundaries, the institutions of feuding and warfare are also found. McClellan (1975) describes the expressed need of the Athabaskans to kill all strangers; or those who could not claim a relationship. An intense hatred for the nearby Eskimo is expressed with the apparent trade relationship. Two Athabaskan groups would band together against the Eskimo. The Athabaskans also

fought among themselves. A war party would have a leader, though not an institutionalized chief. The warriors would have physical training, endure a food taboo, and seek the aid of shamans. This warfare could occur in any season. The object of the warfare was to kill all adult males of the opposition group and take the women and children captive. A group could settle the dispute by a payment of wealth.

Summary

Culture systems are as continuous as ecological systems. It is difficult to determine where one culture system begins and another ends. In the study of culture, anthropologists have made subdivisions. The concept of niche has served such a purpose, isolating a group from others based on relations to resources and competitors. In using niche to distinguish cultures, areas of culture types are indistinct; habitats form a mosaic of culture groups. The total environment is not perceived by the culture group. The relevant, perceived, or symbolic environment separates groups. A culture has a circumscribed membership. Individuals and groups encountered by a culture must be accounted for by interrelation or they are seen as a threat to the existence of the culture (a stranger--unknown and unacquainted). Though culture groups must account for other groups by interaction, they

must also emphasize their own autonomy and sovereignty.

Cultural interaction crosses linguistic, ecological, and social boundaries. Culture groups that interact are discriminated by linguistic form, regional habitat or sendentary settlement, and subsistence patterns. Given an environment with fluctuating resources, cultural interaction is a process of ecological and social survival. Interrelations can be analyzed as a sphere of interaction or network. Inter-group relations are based on the associations of individuals. Types of interaction have been explored: alliance and partnership, warfare, kinship, descent, and trade. Warfare need not be opposed to other types of relations or seen as competition for resources or territory. Warfare may result from other elements of interaction. It may function to maintain harmony within the group by expressing hostility and aggression outside of the group. Some observations have been made on the processes of interaction between groups. Two cultural groups can occupy the same area in symbiosis or mutualism if they exploit different resources. In competition for resources, either the more powerful or the weaker group adjusts its niche and relocates in the marginal habitat of the area.

Marginal habitats, transitional areas, and ecotones have been considered in the reconstruction of cultural settings. Phenomena associated with edge areas have been

used to explain observations of cultural interrelations and interaction with the environment. The concept of ecotone has been used in research-strategies in the hope of finding an "edge effect" of cultural diversity and density. The transitional area has been theorized as the setting for the origin of domestication. The transitional zone has been used as a regional framework for the study of culture process.

These anthropological perspectives temper a discussion of cultural interaction in a transitional area. There is a need to assay the effect of the phenomena of edge areas upon cultural population. As transitional areas serve as regions of boundary between two ecological communities, the interface of cultural populations is expected. Differentiation of cultural groups in relation to habitat and niche in the ecological community prefaces the analysis of their interaction. How a cultural group accounts for population outside its membership and perceives their own autonomy, influences the interrelations with other cultural groups. The process of interaction between some groups has been shown to relate to more general biological observations; i.e., two groups with the same niche cannot occupy the same habitat without dominance of one group and niche differentiation and relocation for the other group. The function of cultural interaction is to allow a population to adjust to

fluctuation of resources and flexibility in the social community. These observations about cultural interaction will be placed in the context of generalized ecological interaction patterns. They enrich the ecological concepts in the synthesis of models.

MODELS OF INTERACTION

Models are simplified versions of complex reality. They isolate important properties and functions while filtering the noise of unnecessary information. They are a set of hypotheses with which to organize and classify observations. Models offer a predictive framework with which to view process.

Interaction is a process of change in variety resulting from contact between systems. Population interaction takes place as a result of the individual population's need to survive and cooperate. For cultural populations, that need may be for an expanded marriage universe, or for resources of material, political or social development. Or, interaction may be a response to a culture's need to pit its membership against non-members, establishing sovereignty and autonomy. As a primary process of change, interaction leads to acculturation, growth, decay, maintenance, or disintegration of the population (Clarke, 1968:349).

Since variation of cultural populations is the evidence of interaction, it is important to distinguish that variety normally exhibited by a population from that

variety resulting from the process of interaction. There is a normal range of variability within a cultural population which reflects change and adaptation to a particular region (Binford, 1968:58). Processes influencing this internally originating variety are (1) diffusion or internal trade, where elements of culture travel along a network of interconnection and recirculation; (2) invention or scientific experiment and research where "new" elements are discovered by recombining existing components of the system; and (3) loss or utiliarian displacement of variation because of inappropriate resources, isolated drift, or inclusion in a more general form. Change in variety exhibited by a population may also indicate a complete restructuring and repatterning of that population as a result of colonization or subjection to military conquest, or membership of a federation (Clarke, 1968:411-413).

Variables affected by interaction are cultural structure, zonation and land use, population number and density, and inputs and outputs of resources and technology. Models of cultural interaction deal with adaptive strategies (patterns formed) and adaptive process (change introduced over a period of time). The models represent differentiation, qualitative change, and gradual transformation (Odum, 1975:8; Clarke, 1968:410, 667).

In order to employ models of regional interaction, several preparations should be made. First, variants and gradients of the non-cultural aspects of the region are indicated. Then, distinguishing properties of the populations are defined and described (such as subsistence, social organization, language, boundaries and territories, settlements). Finally, formal and spatial patterns of the population are compared with the region as a whole, defining an ecotope for the population.

Cultural Ecotope

To discover the process of interaction between cultural populations a definition of the ecotope of each population is necessary. Using an ecological method, the ecotope of a cultural group is its functional and spatial role in an ecological system. The ecotope is the combination of two elements: the functional niche and the spatial habitat.

In general terms, the habitat is composed of inter-community variables. It is the set of environmental resources available for a group to exploit. These resources are available for use by any population. The habitat can be described in terms of accessible water bodies (lake, river, stream, ocean, and snow melt). The vegetation community is part of the habitat as it can be utilized for shelter, clothing, food, and technology.

The birds, animals, and fish (insects, amphibians, and reptiles also) are important in their availability for food, shelter, clothing, and technology. The physiographic variables of elevation and relief are important to settlement location. Diversity and variety of resources may be localized and their availability may change seasonally or yearly.

The niche of a cultural group is the structure which it imposes on the environment. It is comprised of intra-community variables. It is detailed in socio-cultural organization: political, social, and economic groups; leadership, marriage and residence patterns; and the distinction of territory and property. Variables of economy and subsistence are also part of the niche: preferred foods, seasonal exploitation patterns, intensity of exploitation (numbers of group cooperatively involved in subsistence activities), exchange mechanisms of reciprocity and resource distribution, and technology of exploitation, storage, preservation, shelter, and mobility. Belief in origins, ideology, and values are also variables that structure the interaction with the environment (including symbolic identity, prestige, wealth, supernatural conceptions, descent systems, and methods for incorporation of non-group members). These variables describing the function of a group are associated. An individual member of a group need not follow the

collective pattern of the cultural group's niche. The niche is the collective function of the group.

The combined variables of niche and habitat, then, form a patterned population response, the ecotope. That pattern is the adaptation and operation of the population in the environment. The density, distribution, size, and structure of the population's elements in relation to resources outline a culture group's ecotope. An equivalent of what is being labeled here as the ecotope has been labeled by others as subsistence and settlement patterns. Variables of these patterns include duration of use and permanence of occupation, location, and seasonality. House, fishing or hunting camp, look-out, and burial and ceremonial sites are elements of the patterns. The ecotope of a population reflects the interaction with the environment by the culture group.

The habitat, niche, and ecotope of each population can be described and analyzed toward an understanding of cultural interaction. The similarities and differences of the groups indicate where and how populations must adjust to each other's presence. These adjustments are in qualitative and quantitative change or gradual transformation of variety through space and time (Clarke, 1968:310). Such observations about the interactions of cultural populations can be compared to the general models of interaction developed here.

These models are classified according to the consequences of the interaction to the stability of the ecological system. The interaction can have a negative, positive or neutral influence on the system as indicated by a change in variables of zone and resource use, population number and density, and diversity and variety. The negative interaction results in inhibitions to one or both populations. The positive interaction results in gain for one or both parties. The neutral interaction does not affect the balance of the ecological system. The models of ecological interaction are summarized in Table 4 as well as presented in the following text.

The Negative Form

Competition, predation, and parasitism are patterns of interaction that negatively affect the balance of an ecological system. That impact is generally a fluctuation in number and density of the elements of the population over time and qualitative change in the variety of resources exploited. These interactions are digressive, in breaking down the stability of systems.

Competition is interaction between populations whose niches and patterns of resource exploitation overlap. It denotes a striving for the same elements and mutual inhibition. Competition may exist when there is an inadequate supply of resources or an overpopulation.

Table 4

Interaction Models

CLASSIFICATION OF MODELS	FORMAL STRUCTURE (niche)	SPATIAL ORGANIZATION (habitat)	TEMPORAL PROCESS (ecotope)
NEGATIVE			
Competition	modification of adaptation--exclusion or diversification/interference in adaptation--alliance and warfare	resources not fully exploited (demand may exceed supply)/ differential, graded or interlaminated resource use	diversification and redefinition (elimination?) of group/stimulus toward change/ common struggle
Predation and Parasitism	prey/plunder upon one group--lack of alternative population limits--incomplete adaptation to subsistence resources--dependence--slavery, potlach, castes	nested settlements/ margin between populations with one group mobile	cycles of growth and decline--one group's cycle followed by the other

Table 4 (continued)

POSITIVE			
Mutualism	equality, dependence/obligations for mutual aid and cooperation descent groups, alliance systems	interdigitation of resources/symbolic boundaries/dispersed settlement/common ownership	survival of distinct populations in a steady equilibrium or increase
Proto-cooperation	benefit to both groups but not necessary/reliable surplus/ reciprocity	settlement independent of resources/symbolic boundaries	increased specialization of resource exploitation
Commensalism	one group obtains resources from another--inequality--guest/host without damage to host--surplus reliable--tribute systems	nucleated settlement pattern/cline of complexity of organization	centralized growth population/not in direct association with subsistence base
NEUTRALITY AND INDEPENDENCE	lack of interaction, contention, stress, boundary/freedom/ periodic surplus or resources not fully exploited/ proclaim and maintain surplus	defined territory boundary, frontier, threshold/physical-symbolic separation between nucleated settlements	change of territory or boundary with increased separation

Competitive interaction occurs primarily between the same kind of, or even related, groups. It is therefore part of a process of distinction between similar groups. The populations interfere with each other, though not necessarily for food and space. The interaction is not necessary for the survival of either group. Competition benefits the groups in stimulus to change. The interaction can evolve into a more beneficial one. Though without change, the relationship contributes to an unstable system.

The process of competition results in a change in the form of the populations. It modifies the adaptation of both groups. Populations diversify or specialize their niche by time, region, or variety of resources exploited. The process is one of external stimulus, where both populations respond similarly to the same needs. Cultural groups adapt as a result of warfare, observation, or a transfer of knowledge. The process can also be one of diffusion of elements of culture from one group to the other as in economic trade and gift exchange.

Competition results in a reordering of the spatial quality of the cultural populations. Resources are not fully exploited. Rather they are used differentially, perhaps by season, region, or variety. The organization of the population is more territorial. Generally, at no time are all the resources exploited by either group.

The habitat is limited (food, space, and other resources). The populations are mutually inhibited. This competition results in pressure on the population size and density.

Competition is a process of interaction that changes the populations through time. The culture groups undergo a series of modifications until they are dissimilar. This development precipitates a pattern of either competitive exclusion or coexistence. Competitive exclusion takes two forms: (1) one group dominates the locale while the other group occupies the margin of the region and adjusts to the change by increasing the variety of subsistence means, and (2) ultimately, one group succeeds in exploiting the resource by either destroying or incorporating the other group, a case of cultural assimilation where the dominated population might survive as an ethnic subculture. A pattern of fluctuating coexistence is the alternative to competitive exclusion: (1) groups may impose a structure of autonomous differentiation and exploit the same resources with varied degrees of success, or (2) both populations may impose a regional or temporal limit to their exploitation and not overlap in range.

Many examples of competitive interaction can be found in ethnography. In a classic study of warfare, Chagnon (1968:158) describes the interaction of the Yanamamo as a form where the goal is a definition of sovereignty and

autonomy of groups through alliance. Some evidence of spatial inhibition and pressure (population density and number) is indicated by the practice of female infanticide and the described trend of smaller population groups having a greater compulsion to enter into the alliance system. Through time the population groups coexist by emphasizing sovereignty and autonomy by force and aggressiveness. One of Chagnon's main observations is that this differentiation of similar groups is not to define territory, which suggests instead the exploitation of the same resources. Over a period of time, fluctuation and shifts in the groups which are allied is also observed.

Hayano (1974:281), in generalizing about the "acephalous" Melanesian populations, describes similar forms of warfare and alliance. He isolates demographic (spatial) variables that contribute to the competitive interaction. These are a low population size and density relative to an unavailability of marriagable females and are compounded by a preference for polygamy. Through time, great importance is placed on symbols of group identification. He describes political alliances formed mainly through exchange of gifts and women. "These exchanges result in cross-cutting friendship and alliance ties between groups creating mutual and conflicting interests and obligations as part of the <u>continual</u>

unstable process of alliance formation in small-scale societies." [Emphasis added.]

Divale and Harris (1976:521), describing competitive interaction, used cross-cultural data even more generally to explain the perpetuation of warfare in bands or villages and its link with selective female infanticide. They view this inhibition "as a response to the need to regulate population growth in the absence of effective or less costly alternatives." The competitive process limits the ecotope, necessitates the distinction of groups, and allows for the coexistence of population groups. Over time, the competitive interaction could evolve into a positive form. First it becomes one of proto-cooperation if the resources increase to more than fill the demand, then changes to mutualism if that interaction is necessary to the groups' organization and autonomy.

Predation and parasitism are also interactions that negatively influence the balance of the environment. Both types of relationships result in a marked fluctuation of population. These two interactions are considered together because of their similar form and function. One group uses the other population as a resource, though each population benefits from the relationship in long term ecological terms. The parasite or predator population causes a population decrease in the prey group. That

need of the exploiting group then becomes difficult to fulfill which in turn causes a decline in the predator population. That decline allows the prey population to expand again. And the cycle of fluctuating population begins again.

The interactions of predation and parasitism result in key developments in the structure of the populations. There is a lack of alternative structural sources of population check found in the exploited (prey) population (such as infanticide, internal warfare and feuding, sacrifice, disease, and subsistence on variable resources). Simultaneously, the exploiting population develops a need to use the other population (for example, as slaves, laborers, mates, or to fulfill a ritual). The interaction may cause group repatterning in organization, military control, or unification. Variety may intrude into the form of a population as a result of that population's insertion into its own system of a new segment (such as slaves, workers, specialists, renegades, or mercenaries). Cultural elements of the populations may change in response to diffusion from trade or gift exchange, from the stimulus of warfare, or observation of variation in other cultural populations.

The spatial organization resulting from these interactions of predation and parasitism depends on the form of a population's use of the other group in respect to

resources. (1) A wide margin may separate the populations in the form of a distinct boundary or a buffer zone. The exploiting population would have a particular adaptation to allow movement across the boundary. Either fear of the predator population is great or the harvest of the prey insignificant. Otherwise the interaction could easily become one of competition. (2) Both groups cohabit a region with the predator population maladapted to exploiting sufficient resources but dominating the prey population in another manner. This interaction could be between distinct population groups nested in the same habitat. A system of castes may be an example of the logical extension of this form of interaction.

Change through time is an evident result of the interaction of predation and parasitism. It is an alternate rise and fall, increase and decrease, decline and expansion in the variety and size of the population groups. The degree and regularity of these fluctuations are different for these two similar interactions. Usually the parasite population does not directly or immediately kill the host, resulting in a slow and irregular cycle. The predator pattern is drastic and regular.

Cycles of feast and famine in village India are one source of an example of a relationship of predation and parasitism. Interdependent castes can be viewed as

cultural groups that interact in a nested heirarchy. Each cultural group is dependent upon other groups for some aspects of subsistence. Some of these castes hold economic and political control of the region and are supported by the subordinate castes. The ruling caste is responsible for the subordinate's welfare. The subordinate castes pay tax and rent to the rulers, and perform ceremonial service (Marriot, 1955:54). The castes consist of workers, specialists, and even mercenaries. Villagers associated with one caste or a cluster of castes may be specialized.

> Not all can produce the complete range of foodstuffs needed to provide an adequate or satisfying diet. From this it follows that there must be an exchange of goods and services between them, and that different villages concentrate on the production of goods and services. (Beals, 1962:84)

The living system is dependent on a nested heirarchy of distinct cultural populations, castes. When a disaster such as an epidemic or famine occurs, it results in a shortage of resources most affecting the groups on the lower end of the heirarchy; diminishing support stimulates a change in the charge of power and prestige in the ruling class.

Given an environment with a reliable surplus of resources, this parasitic interaction could change into a positive form of interaction, commensalism. (The difference between these two forms is that in predator or

parasitism the lack of a reliable surplus makes the interaction detrimental to the host population. Sufficient resources allow the interaction necessary for the survival of the guest population without harm to the commensal host population.)

The Positive Form

Mutualism, proto-cooperation, and commensalism are patterns of interaction that positively impact the balance of the ecological system. That impact is generally a redistribution of resources and an increase in variety of cultural elements over time. These progressive interactions contribute to an increase in the flow of energy in the life systems.

Mutualism is a relationship that is necessary for the survival of both interacting populations. The interaction provides for a sharing of resources particularly in regions where a diversity of resources is available, and where the availability of these resources may fluctuate. The difference between this mutualism and the interaction of competition is that in the latter the population groups are more independent. Competing groups do not depend on an interaction between the groups for their survival. After a period of time the process of competition may evolve into a process of mutualism, or vice versa.

A relationship of mutualism results in population

groups being integrally related in an adaptive system. The population group itself though, will put emphasis on its autonomy, specialization, and separateness while depending on cooperation with other groups. Two functions will be operating simultaneously, an institution distinguishing groups (autonomy, sovereignty, and warfare) and one reinforcing the interdependence of groups (alliance and descent organizations). Change in cultural elements resulting from the interaction will emerge from diffusion between the population from trade and gift exchange, and from observation and transfer of knowledge. Redistribution and economic relationships require a similarity of the partner populations of the mutual interaction. The relationship may appear to be one of predation or parasitism but is distinguished in being necessary for the survival of both populations. Mutualism involves a form of common ownership, effort, or control. This shared action is regulated by sentiments of brotherhood and equality, and obligations for mutual aid and cooperation.

Populations mutually interacting will exhibit a particular spatial pattern. Population groups may be interdigitated in respect to specialized resources exploited. Each population, though, is associated with a set of regional or ecological factors. A population will have a unique subsistence pattern that seasonally takes them into the region of another group. The population

groups are separate, but the associated territory or region is not bounded or defended. The distribution of settlement of the populations is dispersed.

The temporal change associated with mutual interaction depends upon maintenance of a balance of the population's conflicting needs to remain distinct and to be part of a dependent system. If the groups overemphasize distinction then the relationship between them will become one of competitive interaction. On the other hand, if the populations allow themselves to be too similar then they will become one group (acculturated) or form a federation or other larger organizational structure. Maintenance of a mutual interaction is beneficial primarily in instances where there is some variability in the availability of resources.

Examples of mutual interaction are many. The Bantu farmers and the Pygmy hunters are a good example of two very distinct populations that rely on alternative resource systems. The Bantu periodically exchange their vegetable products for animal protein from the Pygmys (Turnbull, 1962:47). The relationship between the Iroquois and the Delaware as described by Miller (1974: 511) is an interesting case of mutualism. The network of trade, redistribution, and economic interaction may have resulted from military conquest or political agreement. The process designating the differences of these similar

groups is called the transformation, following Levi-Strauss. This transformation is a process by which cultural features are made distinct (by reversal, segregation, or redefinition) on either side of a cultural boundary. The designation of the Delaware and Iroquois as respectively feminine and masculine (or the women and men groups) is echoed in other interactions: those between the Tewe and Keres, the Pawnee and Winnebago, and the Shawnee and the Delaware.

Proto-cooperation is an interaction quite similar to mutualism. The primary difference is that proto-cooperation is not necessary for the survival of either group. Both groups benefit from the relationship. That the groups are not dependent on each other is explained by a reliable surplus of resources. The interaction can be viewed as primary or low-level in that it is nearly automatic and involuntary. Both groups sense advantage and so they interact.

The interaction of proto-cooperation is one where distinct cultural populations vacillate between cooperation with and independence from each other. Some degree of specialization of resource exploitation occurs which contributes to a network of interaction. Balancing this differentiation, a natural pressure toward increased similarity of the cultures will occur consequent to diffusion from interactions of reciprocity, trade, and

gift exchange. Variety and change are also stimulated by the introduction of a sub-cultural segment to the population: slaves, workers, renegades, mercenaries, and specialists. Neither group is dependent on the other as a population control mechanism.

The spatial organization resulting from an interaction of proto-cooperation is diagnostic of the form of the interaction. More sedentary settlement is associated with reliable resources. Yet, the interacting populations are spatially, and in respect to shared resources, independent. A symbolic boundary separates the groups with neither having a need to defend the boundary.

The temporal process that is associated with proto-cooperation is a change first toward increased specialization of resource exploitation and then increased dependence and interaction. Again, this may result in repatterning of the populations into one group or federation of groups. That change depends upon the assertion of the groups to survive autonomously or to cooperate more intensely.

An example of cultural groups interacting in proto-cooperation is the regional pattern of the North Pacific Coast. It is an interesting one in that an examination of various observations made over a period of time (Boas, 1966; and Drucker, 1965) allows an observation of change in interaction of the culture groups between competition,

mutualism, and proto-cooperation. (This is bounded by the limits of the original observations.) The region is comprised of quite distinct populations (linguistically also) that have a similar major mode of subsistence and yet depend on some specialization in resource exploitation. They depend on salmon for subsistence and are able to counteract a fluctuation in supply with a technology for storage of surplus. The cultural systems--demonstration of prestige and autonomy, clan relationships, the institution of the potlach--all depend on a shared, abundant resource and redistribution of the surplus. As proto-cooperation, the interaction is mutually beneficial but not necessary for the survival of the individual groups.

Commensalism is a third positive interaction form. One cultural population dominates the interaction and is the primary beneficiary. Commensalism depends upon a surplus of reliable resources processed by a subordinate group and channeled to the dominate cultural group who redistributes the surplus. The interaction is associated with a cline in complexity of social organization. The subordinate group pays the dominate group in acknowledgement of submission to political or economic power. The subordinate population receives advantage, or is at least not harmed, in being allowed to survive with a limited degree of distinction and autonomy, and is

afforded military, political and economic protection. The dominant population subsists as a lodger and ruler among the subordinate population.

The commensal interaction is similar to predation and parasitism, in both cases one population benefits. In the commensal interaction the host population is not harmed because of a reliable surplus of resources. Neither group depends on the other as a mechanism of population control. The dominant culture group is dependent on the other group for subsistence. The subordinate group slowly restructures the military, political and economic pattern of their population while retaining distinguishing elements. In contrast, with predation and parasitism only one population benefits and the host or prey is harmed by the interaction. The interaction determines a long range cycle of growth and decline of the populations. The host or prey population defends itself against the other population without absorbing elements of the offensive cultural system.

Two facets of the spatial organization of interacting populations indicate commensalism. The settlement pattern is independent of the location of subsistence resources and tends to be nucleated. The settlements reflect the cline of complexity of the interaction, with the subordinate group incorporated into the social organization of the dominant group. Examined separately though, the

subordinate group provides an autonomous social structure and system.

Centralization is the long range cycle of growth and development by populations with commensal interaction. Through time in a region, the growth of the population does not parallel and is not in direct association with subsistence resources. The interaction is the seed of the formation of international economic blocks or federations. Variation and change in the separate population cultures is a result of diffusion from economic trade and gift exchange, observation and transfer of knowledge, and deliberate utilization of a subcultural segment (specialists, workers, mercenaries).

Cultural examples of commensal interaction are best found in tribute systems of emerging states or civilizations. The often described peasant class can be understood as the host to the dominating though dependent aristocratic class. Such a symbiotic interaction described by Sanders (1968:88) for Mesoamerica could be classed here as a positive form of interaction. Some of the interaction is commensal in that one population group survives on the surplus resources produced by another group. Flannery (1967:79-110) describes interregional commensal interaction in the formation of the Mesoamerican state, where agricultural surplus could be converted to "imperishable wealth" which could be used to set up

reciprocal obligations with neighboring people whose food supply was even more secure" (1967:81). He uses analogies of Northwest coast interaction between the Tlingit and Athabaskans and of highland Burma interaction between the Shan and Kachin (from Leach, 1954) to indicate the adaptive value of commensal interaction: "They make possible the more nearly total exploitation of a very diversified environment, many of whose sub-areas could not otherwise sustain a self-sufficient population" (1967:79). In all three cases, one cultural group subsisted on a resource that provided a reliable surplus and the other group was maintained by that surplus.

The Neutral Form

Either by its absence or by a form of interaction, the balance of the ecological system may remain unaffected. That is, there is no increase or decrease in the flow of energy in the life system. The interaction is neither progressive nor digressive, and does not cause fluctuation in the population, qualitative change in the resources exploited, or redistribution of those resources.

Interaction that is part of such a steady-state system is unstressed and without contention. It is not symbiotic in that population groups do not live closely

together. Independent populations are symbolically defined as autonomous and self-sufficient with finite territory. Subsistence resources are either not fully exploited or technology is available for storage of periodic abundance. These populations proclaim and maintain an adequate supply of resources.

The territory or habitat boundary may be a traditional edge of environmental use, a buffer zone of no-man's-land between culture groups, or a threshold or frontier. The boundaries symbolically or physically separate populations. These are established by limits of relevant resources, by debate in the past, or from geographical barrier. A frontier is a possibility for expansion of boundary and incorporation of new areas given other growth stimulation (Watson, et al., 1971). The buffer zone that exists between some population boundaries implies recognized territory and its defense. Interaction in the bounded zone is proclamation and maintenance of a region with surplus resources for time of need. The settlement pattern tends to be nucleated with unoccupied territory held as a resource reserve.

Change through time stimulated by this neutral interaction is minimal. Slight shifts in territory or boundary are expected as adjustment to internal variation and development. A change or differentiation in the symbolic identification of the group might also occur.

Stimulus for growth derives internally or by infrequent contact with variation in the boundary area.

Writing about tribal societies in Brazil, Myers (1976:354) mentions clearly defined territories separated by a non-man's-land. The size of the buffer zone seemed relative to the ferocity of the tribes. It was used as a hunting area and entered only after a careful frontier crossing ritual. He mentions that Hickerson's (1965) "war zone" between the Chippewa and Sioux (already cited here) was probably a similar no-man's-land prior to population fluctuation. According to Peterson (1976:355, 356), Northern Californian hunter-and-gatherers, the Maidu and Vedda, similarly evolved boundary patrolling parties in response to population pressure. He also writes of a marginal no-man's-land assimilated into the subsistence range between the Chippewa and Dakota because of population stress. Change in these living systems was stimulated by factors outside of the neutral interaction.

These models of interaction of cultural populations are not an all-inclusive typology, but examples to be amplified. They can serve as predictive patterns formulated from ecological and anthropological observations. Evidence of a culture's formal structure, spatial organization, or temporal process (niche, habitat, and ecotope), could then be used to indicate interaction with other groups. An understanding of interaction enhances

knowledge of living systems and process.

This thesis began by addressing the process of interaction between cultural populations in a prehistoric setting. "Direct observation of differences between cultures, their boundaries, and the interaction within and across boundaries is not possible for anthropologists studying prehistoric societies" (Caldwell, 1964:1). These circumstances must be demonstrated from patterns and relationships of cultural remains. The models here organize potential cultural interaction in an ecological system. They can be used as postulates of cultural interaction against which actual regional patterns and relationships can be tested and analyzed. Further observations about interaction patterns can add detail and depth to the models.

The Transitition Region

The models of interaction are not in the context of a particular ecological environment. Yet, this thesis is concerned with the effects of a specific regional environment on cultural interaction. This section examines the effects the transition region has on cultural populations without regard to a specific form of cultural interaction.

The simplest case is the relationship a single cultural population may have within the transition region. That region is stratified, having two distinct ecological

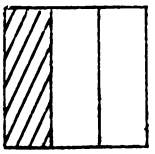
zones separated by an ecotone or edge area. The exploitation of a transition region by a cultural population implies optional forms of adaptation (ecotope). The edge of a population's functional ecological range may encompass one ecological zone of the region, with that range perhaps extending to the ecotone. Or the ecotope of the population may include elements of both ecological zones and may or may not also include the ecotone. Or the cultural group may be particularly adapted to the ecotone (an "edge species"). Figure 2 illustrates these options.

It is important to note that this classification of the relationship of cultural groups to a transition region indicates nothing about the extent of use of the ecological zones. Particular resources may be exploited differently in one zone than in another. For example, resources may be seasonal or used only in time of famine. These variables of degree of use must be accounted for in an analysis. The importance of these considerations is compounded in examining the relationship of more than one population to a transition region.

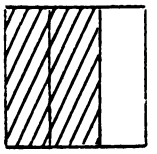
When two cultural groups exploit the same transition region, a pattern of their use of resources in respect to the zones of the region may take many forms. Figure 3 illustrates logical alternatives of the adaptation of two groups to the transition region. Interaction between the

(The box represents a range. The divisions within each box represent divisions of the range into three areas; two major ecological zones and the ecotone between them. Hatch marks (/////) represent the range of adaptation of the population to a region.)

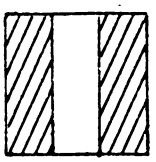
Functional Ecotope Equals One Ecological Zone But Excludes The Ecotone.



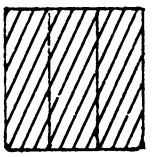
Functional Ecotope Equals One Ecological Zone And Includes The Ecotone.



Functional Ecotope Equals Both Ecological Zones But Excludes the Ecotone.



Functional Ecotope Equals Both Ecological Zones And Includes the Ecotone.



(Edge Species)
Functional Ecotope Equals Only the Ecotone.

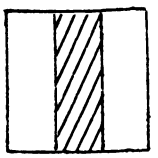


Figure 2

Patterns of Adaptation (Ecotope) of a Single Population to a Region with a Transitional Zone (Ecotone)

(The box represents a range. The divisions within each box represent divisions of the range into three areas; two major ecological zones and the ecotone between them. Horizontal lines (≡≡≡) represent the adaptation of Population A and vertical waves (≋≋≋) represent the adaptation of Population B.)

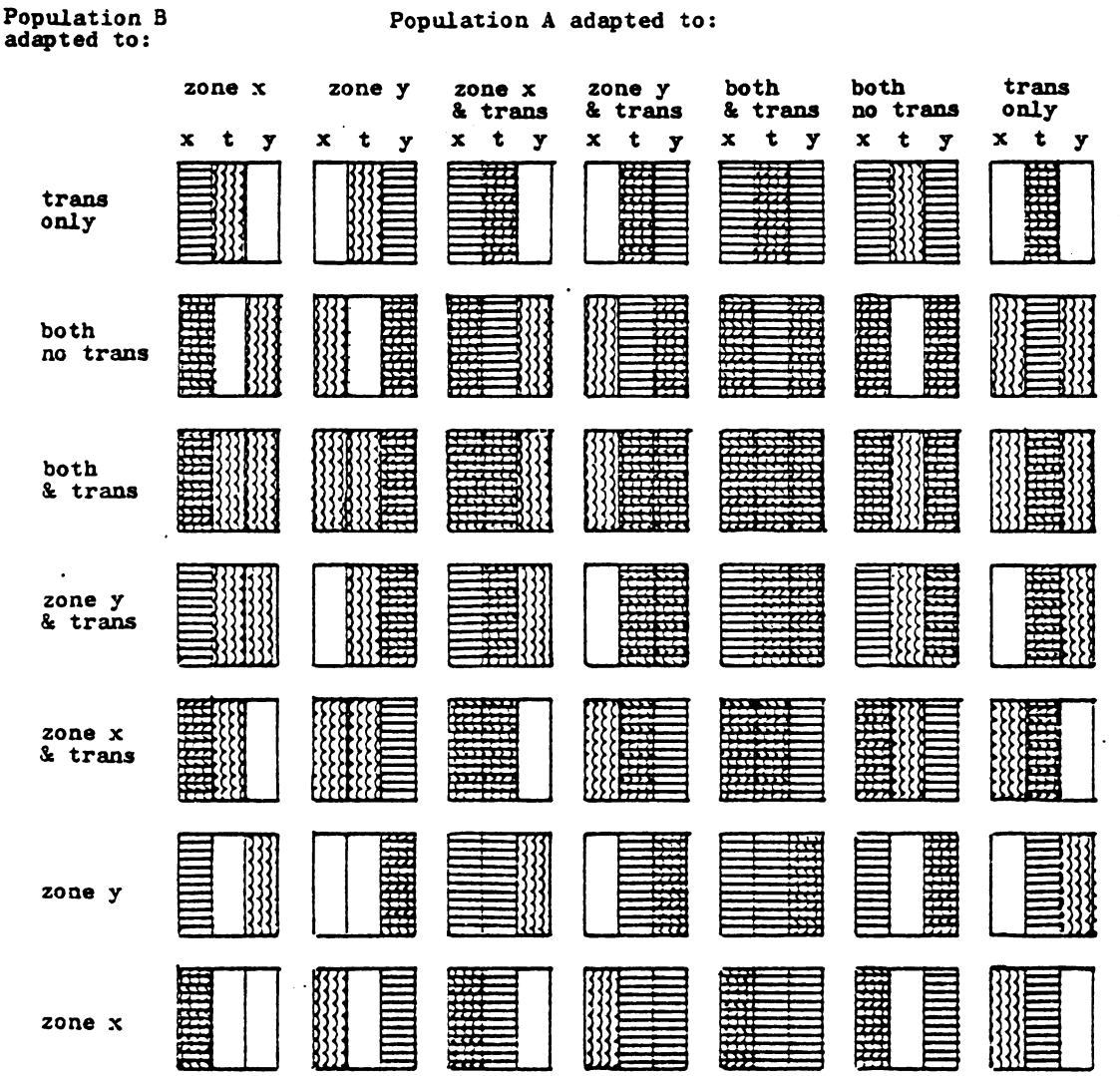


Figure 3

Interrelated Patterns of Adaptation (Ecotope) of Two Populations to a Region with a Transitional Zone (Ecotone)

groups is related to their adaptation to the transitional region. The modification of that ecotope (particularly in patterns of subsistence and settlement systems) reflects the nature of interaction: bounded, competititve, in mutual support, etc. That the adaptation to a stratified environment may itself be stratified must be considered in analyzing the effect a transition region has on the interaction of cultural groups.

Summary

Understanding regional interaction of cultural groups begins with description of the ecological system. The populations are distinguished in comparison and contrast of the variables of habitat, niche, and ecotope. Generalized patterns of interaction are described for use in formal and spatial analysis of interrelations between culture groups in the context of a region. These patterns are grouped according to their impact on the stability of the ecosystem.

Models are constructed to classify the gross structure and function of interaction. They deal with settlement location in respect to resources, with mode of organization, and with process. They represent solutions populations may use in meeting their needs to survive and cooperate with other groups in obtaining energy, giving it form, and passing it on. An application of these

models in analysis begins with a definition of the cultural population and a description of the gradients of their adaptation to subsistence resources within the region. Since the original problem addressed a specific environment, the variety of modes of adaptation to a transition region are reviewed here. How these optional forms of behavior may contribute to an understanding of the prehistoric peoples of the Kenai Peninsula region is next considered.

THE KENAI PENINSULA EXAMPLE

This thesis began as an inquiry about the prehistoric population of the Kenai Peninsula. Using an ecological approach, it outlines a strategy to distinguish and define the cultural affinities of populations. And it presents models to be used as hypotheses in analyzing interaction between different populations in a region. These techniques are designed to contribute to an understanding of the process of cultural change and stability in an ecological system. They are tools that address these questions: what cultural populations occupied the Kenai Peninsula; what portion of that region was part of their relevant environment; what type of interaction occurred between different population groups; how did cultural interaction contribute to variation of population adaptation and development.

Details indicating the transitional character of the Kenai Peninsula have been discussed. This ecotonal region becomes a framework to study culture interaction or interface, as a transition zone is the edge between ecological communities. (It is likely that different

cultural populations exploited the varied habitat.) A cultural population in a transitional region may be at the edge of its ecological range; it may be particularly adapted to ecotonal exploitation; or it may be utilizing portions of the entire region. The Tanaina Indian populations have been associated with the northern and interior adaptation to the Kenai Peninsula while the Pacific Eskimo are tied to a coastal and southern adaptation. The nature of interaction between these populations needs explaining as well as its relationship to the transitional region.

Toward explaining the prehistoric adaptations on the Kenai Peninsula, the designed method is applied. The separate cultures are described with attention given to niche, habitat, and ecotope. Distinction of these adaptations is outlined by comparing and contrasting them in the region of the Kenai Peninsula. Then, hypotheses about the interaction of these culture groups are presented, using the models developed.

The specific adaptations of real populations to the Kenai Peninsula are not described here. Rather a summary of the available ethnography of the general adaptations of the larger cultural groups to which these populations belong is presented. The variation of the local populations from the more general forms may be clarified with further archaeological research. No comprehensive

description of either local group has yet been formulated.

The Pacific Eskimo

The ethnography of the Pacific Eskimo as presented here is compiled from Bearne (1976), Black (1977), Guemple (1972), De Laguna (1934; 1975a; 1975b), Lisianski (1814), and Oswalt (1967).

The collective Pacific Eskimo adaptation was maritime in orientation. Resources from the sea dominated the habitat. The hunt for whale, sea-otter, and seal provided both subsistence and prestige. Fishing for salmon and halibut was of secondary importance and other fish, shellfish, and aquatic birds were taken as reliable supplements. Bear and moose were occasionally hunted. Berries, roots, ferns, and nettles were gathered as food-stuffs. Products of sea mammals were used for techno-logical items: gut and bladder containers, skin tents, skin-covered boats, and so on. The spruce was an important land resource used as logs for houses, and the roots were used in basketry.

The Pacific Eskimo trace their origins in myths to either a dog or the raven. They were organized in male sibling family groups or patri-kins. The family unit had between ten and twenty members and the local group consisted of about one hundred members. A regional group might have had one thousand members. A degree of local

band exogamy existed. Post-marital residence was virilocal or uxorilocal. Polygamy and spouse exchange were practiced, as well as name exchange relations and hunting and trading partnerships.

Formal leadership roles did not exist among the Eskimo. A respected man would be followed. A man was respected for enduring hardship. Others skilled at whaling in particular and also seal and otter hunting were held in esteem. Whaling crews would be recruited from among the most respected hunters in the region. Some particularly skillful men were admired and sought after to teach children. Shamans (men or women) had supernatural powers which they received through no will of their own and developed them with the help of a senior shaman. Shamans were granted a different type of respect. The house in which an Eskimo died was sealed or destroyed, the body inhumed in a flexed position or dismembered (the last connected with a whale hunting ritual).

The ecotope of the Pacific Eskimo is described in the following seasonal subsistence pattern. Beginning in the spring from the semi-permanent settlements, the local group would harvest the early salmon with dip nets and fish spears, running in the nearby streams and rivers. As summer approached, small groups of people would move from the settlement. The men hunted sea mammals and birds and the women gathered berries, ferns, roots, and

nettles and would fish. Trade fairs were held in the summer with people traveling to and from various regions. At the end of the summer, fish from the last runs would be dried and berries preserved. People would then move back to their winter settlements near the coast. In the fall, messenger feasts were held (the invitation extended to particular groups). A mid-winter festival was also held. In winter, as stores ran low, mullusks were harvested. Throughout the year, the maritime hunt contributed to subsistence.

From archaeological evidence, the Pacific Eskimo selected their village sites on some principles. "These are an extended view and possibility of escape by boats in several directions . . . Refuge islands were also used" (De Laguna, 1934:163). The sites were located near a stream (but not so near as to interfere with game use of the stream) and near the shoreline for access to shellfish. The populations of the winter settlements may have been as high as three hundred. D. W. Clark (1966a:7) estimated that on Kodiak Island the peak population was eight persons for every mile of shoreline. Houses were semi-subterranean with log sides and sod roofs. One communal kitchen was surrounded by two or three small sleeping houses. These smaller rooms might be filled with hot rocks for a sweat bath (the Eskimo did not use steam in this region prehistorically). The

settlement had at least one very large house. This was the men's "kashgee" which is where ceremonies and festivals were held. (This structure has been called various names and reported to have been destroyed at the end of the winter festival) (Bearne, 1976:5, 20). Skin tents with whale rib and vertebra, and rock structures, were used during the summer nomadic hunting and gathering periods. An inventory of skin-covered boats, which were skillfully handled, was used for both hunting and trading.

The Tanaina Indians

This Tanaina ethnography is compiled from Jacobsen (1977), Osgood (1937), Townsend (1974), VanStone and Townsend (1970), Von Wrangell (1970), and Zagoskin (1967).

The adaptation of the Kenai Peninsula Tanaina population was based on the large salmon runs in major streams and rivers. Hunting of caribou, moose, and sheep was also important. Bear, beaver, and wolverine were hunted for their skins. Women hunted squirrels for clothing. If the small beluga whale came near shore, it would be taken. Berries and roots were gathered. Vegetation sources were depended on for utilitarian objects: spruce root and birch bark containers, bark and logs for canoes, and logs for houses and caches.

Tanaina origin myths trace the descent of the group

from the raven. The population was organized into two moities with eleven matrilineal clans or sibs. Cross-cousin marriage was preferred and polygamy permitted. Initial post-marital residence was matrilocal, probably because of a bride service requirement.

The Tanaina did not have hereditary leaders. They had a system of wealth and prestige. A man gained prestige by being a successful shaman, a good hunter, or a successful trader. Prestige was expressed in potlaches held at the death of a relative. The Tanaina cremated their dead or set them in boxes covered with stone.

The Tanaina subsistence pattern also included harvest of the spring salmon runs. As summer approached they moved into fish camps on the river and lake edges, not far from the semi-permanent settlement. They camped in tents of skin or bark. Fish weirs and traps were set and the fish were intensively caught, dried, and stored in underground or log-raised caches. Berries and plants were gathered during this time. At the end of summer, the Tanaina returned to the villages. Some of the people traveled over the mountains to participate in caribou drives. Others hunted moose or mountain sheep. Women went squirrel hunting and berry collecting. Large groups of people gathered for trade fairs. In winter, the Tanaina returned to the villages and ate the stored foods. Rabbits and Ptarmigan were caught to supplement the diet.

Villages sponsored small winter festivals if food was abundant.

Tanaina village settlements were located near the coast and major rivers, or near a lake. Village populations numbered about two hundred. A house held the local descent group, maybe thirty people. The houses were large rectangular log structures with partitions and added rooms. The house had a central hearth. Steam bath houses were located nearby or attached to the house. Hot rocks were brought in and water sprinkled on them. In fish camps the population was dispersed and lived in tents in nuclear family units. The camp had many pits for fish processing and storage. Hunting camps were occupied temporarily and consisted of a sparse shelter. The Tanaina used birch bark canoes on rivers and lakes, but did not navigate the ocean waters. Some large hollowed tree canoes are reported to have been used by the Tanaina to cross Cook Inlet.

Regional Adaptation and Distinction

The Eskimo and Tanaina were known to have engaged in mutual trading. The Eskimo received caribou, bear, marmot, and beaver parkas, wolverine skins, caribou antler for arrows, caribou chest hair for embroidery, porcupine quills, and hats woven of spruce roots. The Tanaina received "sukli" (bone ornaments made in a spiral,

perhaps imitating dentalium shell), amber, squirrel and bird parkas, whale and seal oil, and skin boats.

Both the Tanaina and the Eskimo organized war against each other and among themselves. The Tanaina "were a powerful people and were respected and feared by their Eskimo neighbors with whom they fought" (Townsend, 1974:4). The Pacific Eskimo had large organized raids of regional bands against the mainland, island, coast, or interior. Both groups used bows and arrows and clubs and defended themselves with shields. The strategy of warfare was surprise attack. The defense tactic was to scatter and hide at first warning. Prisoners were kept as slaves. An Indian or Eskimo afraid of being taken a slave would kill himself and his family.

These relationships of trade and war between the Tanaina and the Pacific Eskimo crossed cultural boundaries. They functioned to redistribute resources, expand the marriage universe, and define the autonomy of each group. The relationships are part of an adaptation to the diverse region. They allow an expansion of variety of resources available to the groups while mandating a degree of specialization and differentiation in resource exploitation strategy.

The two populations are distinguished by their ecotopes as being two cultural groups. The type of social organization is different for both groups. This is

reflected in the different settlement patterns, though duration of occupation and house structure and size are quite similar. The Tanaina depend on an intensive harvest of salmon and the Eskimo subsist on a wider range of resources. Ideology and value systems are dissimilar. Given these separate adaptations, the environment of the Kenai Peninsula limits the area exploited by either one of the groups.

Prime winter settlement positions for the Eskimo are limited as one moves northward on the Cook Inlet shoreline. The mullusk population along the shore is dense in the south, but slowly decreases moving north until they are sparse north of Ninilchik (probably related to water temperature or salinity). Sites with a good view in several directions and near a refuge island are limited to the southern area. Large whales rarely venture far into the inlet. Seals are associated with rocky islands and shores and found only in the south or across the inlet. Settlement too far north on the peninsula would mean a change in subsistence strategy for the Eskimo. A maritime orientation would be difficult. Summer subsistence patterns would be successful on the northern part of the Kenai Peninsula except that the distance traveled to hunt sea mammals would be great, though comparable with distances traveled by the Kodiak Island population (100 miles). Also, some vegetable foods used

by the Eskimo only grow in the warm moist climate of the south.

On the other hand, the Tanaina were dependent on large rivers and lakes for fish and travel and on easy access to the mountains to hunt. These features are found most densely in the north. One might speculate that the Tanaina range was related to the range of the caribou. If the caribou came down into the southern peninsula then the Tanaina could follow. Otherwise the Tanaina would need to adapt their subsistence strategy to emphasize different game to supplement the salmon. (Recent experience of the salmon fishing industry indicates that the fish run in cycles of abundance. Total dependence upon salmon may be unsustainable.) Birch, used for material adaptations, is found predominantly in the north. Berry communities are also different from north to south. The Tanaina depended on these specific resources.

These ethnographic details are a reconstruction of the adaptations of cultural populations during the historic contact period. Populations utilizing different facets of the transitional Kenai Peninsula region are indicated. Evidence for contact and interaction between the populations derives from the description of trade and war. That the groups also intermarried would follow the pattern for the Tanaina and Eskimo relations in other

regions (VanStone and Townsend, 1970:133).

Does the distinction of these cultural groups simply reflect an adaptation to particular elements of the environment or does it also indicate limits placed upon the groups by interaction with each other? The two groups may have exploited the same resources and then differentiated. The form of interaction between the groups may have taken one of several forms.

Interaction Hypotheses

The general models developed here of population interaction can be applied as hypotheses to be tested to explain the nature of interaction between the two populations. With the present information about the populations of the region, any of the models may describe the form of interaction.

It has been assumed that just prior to historic contact, the Kenai Peninsula Eskimo declined because of pressure from the Tanaina, implying competition between the two groups and explaining our lack of information about that culture (Oswalt, 1967:190). Not being able to compete any longer, the Eskimo may have been displaced by the Tanaina. Another model explaining the drastic population fluctuation would be predation. The region may have been a buffer zone of warfare. One of the populations may have been reliant on one of the products of war for survival and periodically invaded the other group

to obtain these resources, and in doing so crossed the buffer zone.

Given that the region is an ecotone, a high density and variety of some species may have existed. This surplus could have allowed one group to serve as a host to the other in a relationship of commensalism. There may be evidence of an interaction of proto-cooperation prior to historic contact. Functional specialization of living sites and a stable equilibrium through time of both populations would be indicators. The trade and warfare activities of the populations may indicate some mutual benefit gained by both groups. This interaction of mutualism has parallels with that described by Burch and Correll (1971) in northern Alaska. Finally, a zone in the transition region may have represented some neutral ground between the culture groups agreed upon by them, with warfare resulting from a breech of contract and/or declaration of autonomy.

Though each of these models may constitute a description of the interaction of the Eskimo and Tanaina of the Kenai Peninsula, each carries with it a set of criteria that have to be established (settlement pattern, population response, etc.). These models then can be viewed as a set of alternative hypotheses to be tested against archaeological observations. As the region is a transitional one, another hypothesis is possible.

A temporal perspective might indicate a subtle environmental fluctuation mirrored by a change in utilization of the region because of change of resources by one group or the other.

Summary

Using an ecological approach, this thesis develops models to explain prehistoric processes. In examining detail of the adaptation of the Tanaina Indians and Pacific Eskimo to the Kenai Peninsula, the possibility of their interaction is noted. Models of types of interaction are shown to be possible explanations of the nature of interaction between the populations. These are presented as hypotheses to be tested against archaeological data.

Explanation of interaction between these culture groups should contribute to knowledge of the movement and development of culture traits and adaptation. Interaction may result in acculturation, growth, decay, maintenance, or disintegration of the adaptive systems. These are facets of a process of differentiation, qualitative change and gradual transformation.

CONCLUSION

This thesis contributes to the theoretical groundwork upon which regional archaeological research builds. An ecological perspective is assumed toward integrating knowledge of human adaptation with that of living systems. Simple models of population interaction are derived for use in predicting the form of interface between populations and its affect on the processes of change. Ecological and anthropological concepts are synthesized toward an explanation of living systems--to define discrete units and describe a process, interaction.

The particular approach is selected as one fitted to explain the prehistoric interaction of the Tanaina Indian and Pacific Eskimo on the Kenai Peninsula. Use of the models to predict settlement and subsistence patterns should solve some of the difficulties of distinguishing prehistoric occupations of these groups in the region. In addition to the clarification of these spatial relationships, the temporal dimensions of the occupation of the peninsula would be defined. Understanding of the processes contributing to culture change in Alaska would be increased. The consideration of the transitional

character of the region may demonstrate association between human interaction patterns and the greater cline of the biological community.

Anthropologists have already used the transition region or ecotone concept as an explanatory framework for their research. It seems appropriate to further test the usefulness of the concept in framing ecological communities by predicting an association of cultural populations with relevant biological communities and then looking for interaction of those groups at the "edges" of the communities. Initial recognition of interaction within transition zones can expand to an understanding and association of particular forms of interaction with quantitatively and qualitatively varied ecotones. The size and form of the boundary area may regulate interaction, or partially determine processes of culture change. A transition zone may be viewed as a stage for population interaction with several sets and backdrops.

In examining interaction, then, this thesis is concerned with the distinction and definition of cultural populations. Conversely, it is concerned with sharing of cultural components between populations. In inquiry about interaction as a process of change, this thesis contributes to knowledge of the origin and growth of culture.

The concepts of niche, habitat, ecotope, and ecotone (developed by ecologists) are used to organize this

discussion of interaction. The first three are used in categorizing cultural populations' adaptation by the structure of exploitable resources (space); the function of the exploitation of those resources (form); and the populations' response to those variables (process). Ecotone is the abstraction of a transitional area between two ecological communities that allows the comparison and contrast of component systems of the continuum (a life system).

The total ecological system is not relevant to a cultural group. Differences in symbolic environments separate cultural populations. Cultural interaction allows the autonomy and sovereignty of the groups. Indeed, interaction necessitates distinction between groups. Interaction between populations must balance the needs of the culture groups to survive autonomously and to cooperate. The constant satisfaction of these needs is impetus for change.

This thesis advances a set of models of cultural interaction. These too are developed out of ecological theory. The models themselves are classified by the influence of the interaction on the "balance" or stability of the ecological system. The implication of cultural interaction for the broad effect of the populations' adaptation to the transition area itself then is considered. Man both affects and is affected by his

environment. The types of interaction that stimulate instability in an ecological system are competition, predation and parasitism. Those contributing to the stability of the system are mutualism, proto-cooperation, and commensalism. A third class of interaction, neutral or independent, neither positively nor negatively influences the stability of the system.

Beginning with a specific region, a strategy has been designed and detailed to investigate population interaction. The logical extension of this work on the Kenai Peninsula is to formulate a set of hypotheses predicting the settlement and subsistence patterns for both the Tanaina Indians and the Pacific Eskimo in respect to relevant resources. Particular attention need be paid to variables distinguishing the populations. The region should then be stratified according to density and distribution of those resources, reflecting the transitional character of the region. The models of interaction should be used to formulate a set of hypotheses that when compared with the settlement and subsistence data from these strata indicate the nature of interaction in the region. This interaction survey must derive from synchronic data, but lead to an understanding of the diachronic process of culture change and development.

This thesis views culture as both defining and integrating population groups. Elements of culture may

change as a result of the process of population interaction. The ecological system in which this interaction takes place may reflect that interaction.

> Most cultural-ecological situations are larger than communities; they include a series of alternative resource systems with exchanges taking place between them: the classic case of Bantu farmers and Pygmy hunters offering each other vegetable food and animal protein, or the many similar cases of symbiotic relationships in the Middle East between pastoral nomads and sedentary villagers, are the type cases in ethnology. To an increasing extent, cultural ecologists are turning to these regional complexes; as they do, the policy relevance of their work increases. (J. W. Bennett, 1976:309)

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