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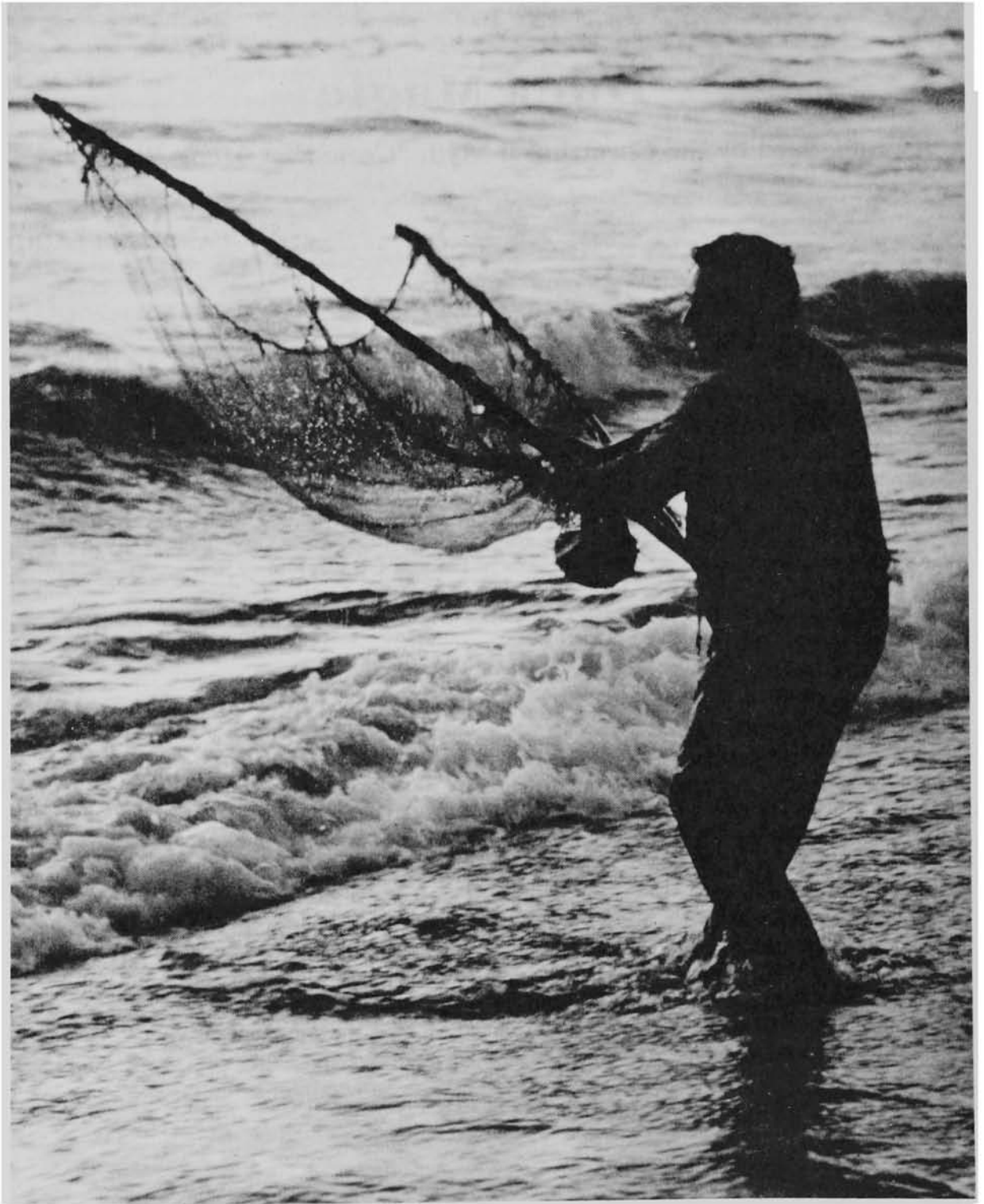


Fig. 1. Smelt fishing with traditional "V"-shaped net, near Smith River, California.

Ecology and Adaptive Response Among the Tolowa Indians of Northwestern California

R. A. GOULD

There is currently a strong trend in the anthropology of California Indians to gather new data and reexamine earlier findings in the light of problems raised by worldwide studies of hunter-gatherer ecology and archaeological explanation. A growing literature addresses the subject of traditional and contact-period Indian adaptations within both pristine and altered ecosystems throughout California. Building upon this, there is also a growing interest in the implications of such adaptations for increased size and stability of settlements, development of class and status hierarchies, the roles of trade, warfare, and ritual as mechanisms for reallocation of resources, and other social elaborations. The rationale for this revitalized interest in California Indian anthropology has centered on a developing awareness that many, if not most, ancient hunter-gatherers lived in well-favored, temperate environments comparable to those of California, and that it was in settings like these that major evolutionary developments relevant to agriculture took place (Bean and King 1974:6).

Thus, we cannot do as Sahlins (1972:8) and some others suggest and simply dismiss or exclude relatively affluent hunter-gatherers like the Northwest Coast and many California Indians as "special cases" that are somehow unrepresentative of hunter-gatherer ecology

and economy. Instead, we must look for processes of adaptation that differentiate hunter-gatherers, and in this regard it is especially useful to examine and compare the extremes of the hunter-gatherer spectrum. What ecological relationships can account for essential differences in social and economic organization among societies as different as, for example, the Kalahari Bushmen and Australian desert aborigines, as opposed to the Northwest Coast and northwestern California Indians? Rather than review the whole range of differences, this paper will focus on one key aspect of this process of differentiation: the contrast between what I shall term here *sharing* vs. *aggrandizive* systems of resource allocation.

Most ethnographic and historic hunter-gatherers possess social mechanisms, usually based upon kinship, that enable them to share food and other key resources and the access to these resources with other members of the same society. Arguments like Sahlins' about the essential "affluence" of hunter-gatherer life (Sahlins 1968:85-89; 1972:1-39) notwithstanding, most hunter-gatherers must find ways to overcome uncertainties in availability of resources. Most often this is done by means of widely-ramified kinship networks that allow people who are experiencing scarcities to share food and, in some cases, even to take up residence with their better-favored relatives. Sys-

tems like this tend to be egalitarian, since an individual sees his long-term security and that of his immediate family as depending upon the maintenance of kin obligations by means of gift-giving. He thus is eager to "give away" any food or other goods that exceed his immediate needs, since he knows he can expect return "gifts" at some later time when he has real need. Under these conditions, the personal accumulation of surpluses is actively discouraged. Security rests in the development and maintenance of the widest possible network of kin with whom one may share food and access to resources in times of need.

Such a sharing system can be contrasted with aggrandizive systems that encourage individuals or individual families to accumulate and store surpluses as security against shortages. This could be called the "money-in-the-bank" approach to security, and it is uncharacteristic of hunter-gatherers generally. In this case, instead of generosity we find thrift, which is to say, both systems call for a calculation of returns at a later date, but they do so in different ways. Neither system is altruistic. Aggrandizive systems may be associated with incipient or developed status or class hierarchies, since such accumulations are generally unequal and become more or less concentrated in the hands of certain individuals or families. We do not normally associate such aggrandizive behavior with hunters and gatherers, since the literature (Service 1966; Lee and DeVore 1968; Coon 1971; Bicchieri 1972) has emphasized the importance of sharing behavior in most if not all hunter-gatherer societies.

The Tolowa Indians of northwestern California are of special interest because they were one of the very few hunting and gathering societies we know of that operated on a purely aggrandizive basis. This paper will show how the Tolowa adapted to the ecological requirements of the northwestern California region, and will try to begin at least to answer the question: What ecological relationships are neces-

sary to account for the rise of an aggrandizive and ultimately status-differentiated social system? This paper assumes at the outset that a simple abundance of natural resources is not, in itself, sufficient to account for this development, although it is one part of the answer. Moreover, there may well be other avenues to status differentiation, even among hunter-gatherers, than simply aggrandizive behavior. Recent studies by Bean (1972), for example, show how individuals among the Cahuilla may have acquired status as managers in the business of redistributing resources. But the Tolowa present us with an extreme case of aggrandizive behavior to an extent unmatched by any other known hunter-gatherers and by few other societies as well, giving us the opportunity to examine this particular mode of adaptation.

THE "FITNESS" OF ABORIGINAL CALIFORNIA ADAPTATIONS

A cautionary note has been sounded by Heizer (1974) about the dangers of accepting published and archival data on traditional California Indian culture at face value, because a long time has elapsed since much of this information was first collected, and it has also been a long time since any California Indians lived off the land in a traditional manner. Much of such data is erroneous, and the judgement needed to assess its accuracy today is not always well-informed (Heizer 1974:29). There is no easy answer to these general criticisms, but certainly there are safeguards which present-day students of California Indians can use that go beyond such obvious measures as checks for internal consistency and historical and archaeological verification. Since much of the renewed interest in California Indians centers on problems of an ecological nature, perhaps we can borrow a page from the ecologist's notebook and apply a general principle which has seen wide use in the field of biological ecology.

This is the idea of *fitness*, which can be defined as “. . . the general level of the health of the total ecosystem” (Clapham 1973:229). This term cannot be adequately quantified, but it subsumes relationships between ecological variables that can be measured, albeit sometimes in a gross form, and serve as guides to the general fitness or health of the ecosystem under examination. For example, we can observe and measure limiting factors in an ecosystem—that is, “. . . any condition that approaches or exceeds the limit of tolerance for the organism or group in question” (Odum 1975:108). Limiting factors exist for human as well as natural ecosystems, and we can be sure that any human situation which violates these limits will be maladaptive and either fail or else require radical adjustments before it regains its fitness.

It follows, then, that any reconstruction of aboriginal California Indian cultural systems can be tested against its fitness with respect to the environmental requirements that could be viewed as possible limiting factors. Such a test requires a high order of environmental reconstruction. Perhaps we can return at this point to Heizer's (1974:30) criticism that there has been a “loss of adequate evaluation of earlier reports” by the new generation of California archaeologists and ethnohistorians, who lack the assurance offered by firsthand knowledge of traditional California Indian culture. Since such firsthand knowledge is no longer possible, a new basis for informed judgement is needed. I suggest that expanded and rigorous application of the ecological idea of fitness, beginning with an examination of possible limiting factors vis-à-vis cultural variables in the reconstructed system, will provide a basis for judgement at least as well-informed as the ethnographic background acquired through firsthand knowledge of traditional California Indians. This approach, of course, goes considerably beyond California studies and can be applied to any part of the world where cultural reconstructions are being attempted.

To apply the concept of fitness in a different way, some cultural reconstructions will “fit” the requirements of their total ecosystems better than others, and a very poor fit suggests a poor reconstruction. Of course, one cannot always assume that all aspects of human behavior in a cultural system conform optimally to the ecological requirements in which that system operates. But extreme cases, in which limiting factors are apparently violated, thus threatening the health of the cultural system, should be examined with skepticism and perhaps even held in abeyance until new evidence permits one to see a closer “fit.” This proposition can be stated as a “Principle of Negative Determinism,” which argues that certain key ecological requirements must be met by every cultural system. Failure to meet these basic requirements will lead to failure or change in the cultural system. The ecological requirements in question do not necessarily determine the specific characteristics of the cultural response (so much for that hoary old straw man, environmental determinism!), but they do limit the options open to people in any given habitat, and they do mean that prolonged lack of cultural conformity to these requirements will not occur.

This test has its complexities. It is possible for more than one kind of cultural adaptation to operate successfully within a single area. The literature abounds with examples like the Pygmy hunters and Bantu-speaking farmers of the Congo Forest, and the Athabaskan-speaking hunter-gatherers and Pueblo cultivators of the American Southwest, whose widely differing adaptive responses within the same region are of long standing. Each culture was fully aware of the other in its area and interacted with it regularly, yet each retained its own basic mode of subsistence. Hunters and gatherers do not automatically become farmers simply because (a) their country is suitable for farming and (b) they know about farming. The point is that each of these cultures occupied its own

ecological niche within the area, and any attempt to reconstruct one of these cultures adequately must also recognize the specific characteristics of the niche it occupied. While a given habitat may contain several potential niches exploitable by alternative kinds of economic or social action, there is no reason to expect that all potential niches in a habitat will be occupied. This seems to have been especially the case in aboriginal California, where areas suitable for cultivation were not cultivated, despite cases where the basic knowledge of agriculture was available. Thus, the Principle of Negative Determinism must always be applied relative to a particular ecological niche, which in turn requires that one be willing to make certain assumptions about the culture and especially its level of technology. But given these assumptions, this principle is workable and can be applied to cultural reconstructions as a test of their possible validity.

THE NORTHWESTERN CALIFORNIA ECOSYSTEM

Topography and Climate

This is a region of rugged topography and heavy annual rainfall. The coastline alternates between stretches of sandy beach and rocky headlands, and offshore there are numerous rocks and islets. There is a narrow coastal plain composed of Pleistocene- and Pliocene-age deposits of sand, and a short distance inland one encounters low but steep hills which increase in height as they merge with the foothills of the Siskiyou Range about 20-25 miles inland, ultimately reaching heights up to 7000 feet. These hills are cut by the North, South, and Middle Forks of the Smith River and their tributaries, forming deep gorges in some places. Except for the coastal plain and a number of small flats along the bottoms of these gorges there is little level ground anywhere in this region.

Along the coast, annual rainfall averages up to 100 inches, with annual averages of up to 120 inches recorded for some areas slightly inland like Gasquet Flat. This rainfall is augmented the year round by frequent and heavy coastal fogs that completely cover the coastal plain and ocean-facing gorges. Rains are strictly seasonal, with about 80% of recorded falls occurring in the period from early October through late March. Despite this heavy annual rainfall, the area occupied by the Tolowa Indians was served by a river (the Smith River) of modest size when compared with the Klamath and Trinity Rivers nearby. Temperatures are mild but cool during most of the year, with strong and cold northwesterly winds prevailing along the coast during the summer months. Snow rarely occurs on the coastal plain or in the nearby gorges but is common during winter at elevations above 2000 feet.

Vegetation

Much of the coastal plain is subject to the effects of wind-borne salt spray from the ocean and is thus treeless and covered only by assorted grasses and low shrubs. At various distances inland, beyond the reach of salt spray, there is a belt of low spruce and pine, and on the Smith River coastal plain there was a dense stand of redwood, now destroyed by logging. The redwood belt extends inland 8 to 12 miles, wherever the coastal fog can penetrate and wherever there is protection from the coastal winds. The redwood forest itself was an important basic resource for the Tolowa for house-planks and canoes, and the forest also contained ferns used in making baskets and was frequented by game animals like deer and elk, but on the whole it was a poor area for food resources. Still further inland, where the hills attain heights of over 2000 feet, one finds large areas dominated by Douglas fir forests extending in some cases continuously from the tops of the hills to the edges of the river. On scattered flats along the east edge of the redwood belt

and in the gorges in the Douglas fir area there are grassy, parklike openings containing small oak groves. Just inland, too, from the redwood belt there is an isolated but distinct area of chaparral vegetation covering mainly the steep hills along the drainage of the North Fork of the Smith River. This is a mixed chaparral containing various species of manzanita and madrone along with open stands of ponderosa pine, and it sometimes can be seen to merge with south-facing slopes containing tanbark oak and madrone on mountains which are otherwise densely covered with Douglas Fir.

Mention should also be made of the vegetation associated with the marine and riverine components of the ecosystem. Along the lower course of the Smith River, where it emerges onto the coastal plain, and also along the margins of Lake Earl, Lake Talawa, and Dead Lake one finds swales containing tule and camas lilies. Camas, though not abundant in this area, was eaten by the Indians, and tule rushes were used for fashioning mats. These marshy areas also sheltered various ducks and geese, although these, too, were of secondary importance compared to other food resources in the area. Along the coast, especially in various rocky inlets, large amounts of seaweed accumulate. The Tolowa collected this seaweed, dried it, and ate it as a condiment. It also served as moisture-absorbent packing material in storage baskets, especially when storing food.

TOLOWA RESOURCE PROCUREMENT SYSTEMS

As the foregoing description should suggest, the Tolowa Indians lived in a relatively small area (about 650-700 square miles altogether) composed of rugged terrain and complex microhabitats of varying richness in terms of human food potential. Despite the fact that logging, mining, and other historic activities have done so much to alter some of these microhabitats, this region has a remarkably detailed

literature covering indigenous food resources and their ecological associations. Sources like Smith (1929), Rostlund (1952), Greengo (1952), Hewes (1942), Kroeber and Barrett (1960), Schaeffer (1958), Hedgepeth (1962), Wolf (1945), and Baumhoff (1963) provide useful accounts of different basic resources, and Lewis (1973) has recently offered data bearing upon possible modifications to the ecosystem by the Indians through their use of fire.

From all this it is possible to develop a picture of the ecological requirements for successful hunter-gatherer adaptations in this area. In order to clarify these relationships, I shall use a modified version of Flannery's (1968) "Procurement Systems" approach in my analysis. That is, I shall examine the universe of edible resources in this region from the point of view of how human beings must organize their movements, technology, and social groups in order to collect them effectively. Various classes of resources may be grouped according to their commonalities with regard to how they are obtained by a human population. These commonalities will provide a basis for observing the nature of interactions between aspects of human behavior and particular ecological variables, leading finally to a view of the total cultural system operating aboriginally in this area.

To begin with, I shall distinguish between Major or Staple Food Procurement Systems and Minor or Supplemental Food Procurement Systems. A staple I define here as any food that constitutes at least 30% of the total diet by weight at the time it is collected. Ideally such staple foods should be identified through direct observation and weighing at the time of collection, but, as this is plainly impossible with California Indians, we must be content with estimates based on data available on the various resources together with existing reconstructions of the traditional subsistence economy. The Major or Staple Food Procurement Systems identified here are so overwhelming

in their natural abundance (as measured by recent studies) and were so emphatically stated by informants and historic sources to be of importance that I feel reasonably well-assured in designating them as staples, even without firsthand quantified observations. Supplemental foods never attained the quantitative importance of staples, but one should not overlook their possible importance with respect to varying the diet and, at times, perhaps even providing much-needed nutritional elements.

Major Procurement Systems

Procurement System No. 1 — Large Sea Mammals. One species dominated this procurement system, the Steller sea lion (*Eumetopias jubata*), primarily because the larger islets off this particular part of the Pacific coast are among the largest summer rookeries for this gregarious species. Steller bulls can weigh as much as 2000 lb., although the females are smaller. The smaller California sea lion (*Zalophus californianus*) also occurs on this coast during the summer and was hunted, but this species does not breed there and was less common than the Steller. Other pinnipeds that were hunted include sea otter (*Enhydra lutris*), Northern fur seal (*Callorhinus ursinus*), and harbor seal (*Phoca vitulina*). Whales were not actively hunted but were consumed whenever found stranded on the beaches.

Sea-mammal hunting required perhaps the most complex technology and highest level of group organization of any activity in Tolowa culture. Sea lions were hunted from large redwood dugout canoes up to around 40 feet in length (Powers 1877:69; Gould 1968). These canoes could be handled in the unprotected seas off the northwest California coast and were used for hunting on the rookeries that were farthest out to sea—Northwest and Southwest Seal Rocks, approximately 6½ miles offshore. The preferred method for killing sea lions was to land on the rookeries and club the animals to death, although animals in the

water were often harpooned. The Tolowa and their coastal neighbors used sophisticated composite harpoons for this task as well as for hunting other swimming sea mammals. Late each summer there was a first sea lion hunt, akin to the pattern of the first salmon ceremony and other “first fruits” ceremonies seen elsewhere on the north Pacific coast (Gunther 1926), which involved ritual prohibitions and restrictions on individual hunting until the “season” was officially opened. Each of the Tolowa coastal villages had one of the large canoes, and sea lion hunts in these canoes were carried out under the leadership of a single individual (Hewes, in Kroeber and Barrett 1960:118; Gould 1968:27). The annual first sea lion hunt represented an even higher degree of unification, in that all of the participating canoes from the different villages travelled together to the rookeries before the actual hunt commenced (Gould 1968:26-28). Once the killing of the animals began, however, the men in each canoe hunted on their own, and each boat independently brought its catch back to its own village. No doubt many sea lions were taken by individual hunters or small groups of men on the rookeries that lay close inshore. For this, all that was needed was the small (about 15 feet long) river dugout canoe together with clubs and harpoons. But serious offshore sea lion hunting required a level of technology and group interaction well in excess of most Tolowa activities.

Sea lions were valued for their meat and oil, and the amounts of both after a successful hunt were prodigious. A single large canoe could be counted on to bring in at least 1200 lb. of edible sea lion meat after a single offshore hunt. This figure is based upon statements by informants that a single large canoe could handle one Steller bull or up to four Steller females at one time. Figures given by White (1953:398) indicate that Steller bulls average 1600 lb. live weight, with about 70% of this, or 1300 lb., consisting of edible meat. Steller

females average 450 lb. live weight, of which 70%, or 315 lb., is edible meat. The animals are reliable in their regular appearance in large numbers at the rookeries every year, making this an exceptional resource. The Tolowa had access to more extensive rookeries than their coastal neighbors; although the coast Yurok, too, were known for their effectiveness at sea lion hunting, especially at Redding Rock (Kroeber and Barrett 1960:117).

Procurement System No. 2 — Marine Shellfish. The principal bivalve collected by the Tolowa was the sea mussel (*Mytilus californianus*). This species is abundantly available along rocky shores at the mid-tide zone where there is strong surf action to sweep in nutrients. This species was favored for its abundance, the relatively large size and amount of edible muscle and other tissue of the individual bivalves, and its generally good flavor (Greengo 1952:65). Mussels are available in large numbers the year round, but during the late summer months they may ingest the marine dinoflagellate *Gonyaulax catenella*, which, while it does no harm to the mussels, can cause severe and even fatal poisoning to people who eat infected shellfish. The Tolowa were aware of the risk of mussel poisoning, but informant testimony indicates that people sometimes became ill and died from eating poisoned mussels despite a general awareness of these dangers.

Nutritional tables cited by Greengo (1952: 83) provide a rough but useful estimate of food value for sea mussels based on figures derived from the closely related *Mytilus edulis* of the east coast of North America. According to these figures, 100 g. of cooked mussel meat can provide 18.2 g. of protein, or about one-half the adult daily requirement. So the daily protein needs of an active adult man could be met by eating only 50 mussels. In addition, mussels are rich in vitamins B₁, B₂, and C. Cooking was generally done by placing the mussels directly in the fire and allowing them to cook in the

shell, although mussels and other shellfish were often sun- or fire-dried, too.

Sea mussels were collected on an individual basis, usually by women. Collection was easy and rapid and was limited only by unusually heavy surf. Fifty mussels, the amount posited for an adult person's daily protein needs, could have been collected by a single woman in about half an hour under optimal conditions, the only strenuous work being the business of carrying large burden-baskets full of shellfish back to the village. Many other species of shellfish were collected, too, including the common littleneck (*Protothaca staminea*), rock scallop (*Hinnites mulrugosa*), northern razor clam (*Siliqua patula*), Washington clam (*Saxidomus* sp.), giant chiton (*Cryptochiton stelleri*), short-spine sea urchin (*Strongylocentrotus*), and various large barnacles. Like mussels, these could all be collected efficiently by individuals, although many of the clams are found on the sandy beaches and required more effort to locate and transport than did mussels and other shellfish that tend to be concentrated on the rocky parts of the shoreline.

Procurement System No. 3 — Acorns. Although relatively poor in acorn-bearing oak trees compared to other parts of California, northwestern California contains three species of oak that bear well and provided a staple food for the aboriginal Tolowa. These three species are valley oak (*Quercus lobata*), canyon oak (*Q. chrysolepis*), and tanbark oak (*Lithocarpus densiflora*), and it is the last-named species that is most abundant in the part of northwestern California inhabited by the Tolowa. These trees occur in groves mainly on small, grass-covered flats in places alongside the Smith River and its branches in some small clearings along the east side of the redwood belt, and they also occur dispersed along the slopes of various canyons. These dispersed trees were little used by the Tolowa, since they occur on slopes too steep for easy movement or collection, but groves situated on the flats

were heavily exploited. Farther inland one finds large oak groves covering portions of the open, grassy, bald areas on the tops of many hills and low mountains, but these areas lay beyond the normal foraging range of the Tolowa and were exploited by other groups. Few of the best oak groves from former times remain intact today, owing to commercial stripping of bark from the tanbark oak and road-building and residential development on these precious parcels of level land.

The oaks drop their acorns in late fall, and one must collect them fairly fast, since leaving acorns on the ground for long renders them susceptible to infestation by weevils. Tanbark oak acorns are thick-shelled, however, and thus less susceptible to spoilage after falling than other species (Wolf 1945:51). Acorn collecting was a group activity, although not in the more formal or organized manner of ocean hunting of sea lions. Families would congregate at the oak groves and harvest the acorns, but the actual collection and later transport and processing of the acorns into edible form was performed on an individual or family basis. Families had to leave the coast at this time, although the distances they travelled were not great. The oak grove farthest inland that was regularly used by the Tolowa occurred near Gasquet Flat, about 15 miles from the sea. Women with burden-baskets full of acorns would move constantly back and forth between the oak groves and their home villages on the coast during this period, and they processed and stored the acorns in these coastal villages. Before leaving an oak grove after the annual acorn collection, families set fire to the grass over the entire flat. Tolowa informants claim that this was done to reduce underbrush and keep the grass from growing too high so that it would be easy to see and pick up the fallen acorns during the next year's harvest, a practice similar to that reported for the Kacha Pomo of Redwood Valley (Kniffen 1939:378).

As is well known throughout the literature

on California Indians, acorns require processing before being rendered edible. The Tolowa, like other California groups, pounded and leached the acorn meat until it was free of tannic acid. To accomplish this, they used ground-stone pestles and large, flat rocks as mortar-bases with basketry hoppers to contain the acorn meat as it was being pounded. This technology, while elaborate, was easily operated within the context of the Tolowa family group (i.e., a man's wives and children).

At this point it may be useful to distinguish technologies of this nature, which I term *appliances*, from those involving a wider social context, which can be called *facilities* (not to be confused with an earlier and quite different definition by Binford [1968:272]). Here I define an appliance as any artifact that must be left more or less permanently at the place where it is used and which is used by a minimal social group performing the task in question. A facility, by contrast, is an artifact that is built, used, and, in some cases, maintained by a task group larger than the minimal social group. The Tolowa ocean-going canoe and its accoutrements may be regarded as a type of facility, in the same way as, for example, the Kepel fish weir of the Yurok (Waterman and Kroeber 1938). In the context of this paper, the concepts of appliance and facility refer specifically to food-collecting and food-processing implements, although these definitions need not be restricted to subsistence in other contexts. Tolowa acorn pestles and mortar-bases were appliances in the strictest sense of the definitions offered here.

Estimates by Wolf (1945:51, 63) indicate that, when dried, 100 lb. of whole *Lithocarpus densiflora* acorns will yield 69 lb. of food material consisting of 2.93% protein, 12.08% fat, 20.14% fibre, and 54.43% carbohydrates, the remaining 10.42% consisting of water and ash. In terms of total nutrients, tanbark oak acorns are less impressive than those from other species of oak, owing mainly to the unusually high percentage of fibre contained in the thick shell,

but they are still to be regarded as significant in an area where so much of the rest of the diet was rich in fats and proteins and, at the same time, somewhat short in carbohydrates. California acorns in general are high in calories, estimated at 2265 calories per pound (Baumhoff 1963:163).

Wolf (1945:31-33, 51) estimates that the production of acorns by tanbark oak trees was about equivalent to that of the Kellogg oak (*Q. kelloggii*), a tree whose productivity is slightly less than the 20 acorns per square foot of collecting ground per season (or 160 lb. per tree each season) noted for the blue or Douglas oak (*Q. douglasii*). In two surviving groves of tanbark oak, one at Pappas Flat on the Middle Fork of the Smith River and the other near Big Flat on the South Fork of the Smith River, I counted mature oak trees in excess of 200 at each grove, while at a smaller flat near Indian Bar on the South Fork of the Smith River I noted approximately 70 mature trees. These observations, made in 1972, must be viewed as minimum estimates, since all three of these areas were at least partially logged in historic times. Still, if we take a conservative estimate of 125 lb. of acorns per tree (slightly below the productivity of Douglas and Kellogg oaks) and apply it to these three remnant groves (minimum number, 470 trees), we arrive at a figure of 58,750 lb. or 29.4 tons of acorns per season, of which about 28,788 lb. or 14.4 tons would have consisted of usable food materials when dried. Incomplete though they are, these estimates should indicate the enormous magnitude of the Tolowa acorn harvest under good conditions, especially since informants have pointed out the locations of five additional flats that formerly contained much larger oak groves than the few that I observed in 1972.

Procurement System No. 4 — Anadromous Fish. Baumhoff (1963:180) correctly indicates the river fisheries resource of the Tolowa as "secondary" in comparison to the much larger fisheries along the Klamath River,

but he also notes that the Smith River is frequented by all of the major anadromous species of fish in this region, including salmon that run both in fall and spring. Of overwhelming importance in this regard were King salmon (*Oncorhynchus tshawytscha*) and Coho salmon (*O. kisutch*). These fish often ran in large numbers on the Smith River and were taken by the Tolowa with spears, net-traps, and various kinds of weirs (Kroeber and Barrett 1960). Most of these devices were built and used by small groups of closely related individuals, mainly individual families, but Drucker describes a communal fish weir at a spot called *munsontun* about five miles upstream from the mouth of the Smith River:

Communal weir . . . built at summer low water on riffle at *munsontun* and/or *militcuntun* (latter site probably older). Owner gathered, prepared materials; called kin and friends to put in. Anyone who helped given fish. V-shaped row of alder stakes, supported by slanting braces on downstream side, supported panels of hazel wickerwork. Point of V was downstream. 2 center stakes driven first, to accompaniment of formula; if easily set, weir was successful. Basketry "trap" a rectangular wicker mat doubled, end and part of side sewn together to make wide-mouthed closed cylinder, placed in apex of weir. Men went upstream, heated rocks in fire, with formulas, from canoes threw rocks in deep holes, shouted, splashed, to drive fish into weir . . . Weir left to be swept away by high water [Drucker 1937:232].

While this device did not compare in magnitude with either the Tolowa ocean-going canoes for sea lion hunting or the Kepel fish weir of the Yurok, it can certainly be rated as a facility according to the definitions provided earlier. Present informants are uncertain in their recollections of this device, and the social organization surrounding its construction and use remains vague.

Salmon meat is rich in calories, averaging around 1000 calories per pound (Rostlund

1952:4). Like other freshwater fish, salmon are rich in a wide array of vitamins (A, D, B₁, B₂, and even some C in the roe), protein (about 15-20% in edible portions), and fat (although this last-mentioned nutritional component is highly variable according to season, feeding grounds, and other factors), but are generally lacking in carbohydrates. Rostlund (1952:5-6) concludes: "The table of calories shows that the high-calorie fishes are the very ones that characterize first-class fishing regions such as the Atlantic and Pacific anadromous areas . . .", and the Smith River, despite its small size, lay in the heart of one such first-class fishing region.

Other anadromous fish besides salmon were taken. Steelhead (*Salmo gairdnerii*), candlefish (*Thaleichthys pacificus*), and Western sea lamprey (*Entosphenus tridentatus*) were caught regularly, although never in quantities approaching those of salmon. Hewes (in Kroeber and Barrett 1960:25-26) describes an unusual technique employed by the Tolowa for catching lamprey using a gaffing chute in shallow water with a white pebble floor. This was a night-fishing technique, and informants have shown me the place where it was used, on a shallow riffle at the confluence of the Middle and South Forks of the Smith River (where these white pebbles occur naturally). This technique, like most other fishing methods of the Tolowa, required the efforts of only a few individuals and could be carried out by members of a single family. With the possible exception of the salmon weir at *munsonun*, Tolowa riverine fishing did not require large groups of families to reside together at special camps near the place where the fish were taken.

Procurement System No. 5 — Waterfowl. Various species of ducks, geese, rails, and murre were caught by the Tolowa, but cormorants (*Phalacrocorax* sp.) were of by far the greatest importance in the total diet. Cormorants were captured at their nests on a series of rocks and sea stacks not far offshore from Point St. George, Pyramid Point, Battery

Point, and several other localities during a brief period in mid-summer when the nestlings were unable to fly and could be taken easily (Howard 1929:378-383; Gould 1966a:84-85). No dietary figures are available for cormorants, but there is no doubt that they were a staple food during the time they were collected. The Indians went out to the cormorant nesting areas in small river canoes, either individually or in family groups, and used clubs to take the immature birds. Aside from the element of timing, no special techniques or organization were required to make efficient use of this resource.

Procurement System No. 6 — Surf Fish. Abundant runs of smelt (*Spirinchus starksi* and *Allosmerus attenuatus*) appear on the beaches of northwestern California in late summer, although the size of these runs is known to vary considerably from year to year. The fish were easily taken by individuals using the traditional V-shaped dip net in the surf (Fig. 1), an efficient technique that has been widely adopted and used by whites living in the area today. There is nothing about the use of these nets that requires any organized effort above the level of the individual fisherman, but the catch can be so massive that transporting it may be difficult. Observations made in 1965 and again in 1972, both years when the smelt runs were large, indicated that a single man can net as much as 200 lb. of fish in less than half an hour, although, of course, some time must be spent beforehand in locating the best runs along the beach. Many Tolowa and other Indians in the area today continue to live along the beaches during August and early September in order to catch smelt, which are still much sought after. Today the Indians use small trucks of four-wheel-drive vehicles to transport the heavy tubs of fish to the camp, but in former times this was done by women using burden baskets. Fish that are not eaten fresh are spread out on driftwood logs to dry in the sun while women and children living at the

camp shoo away seagulls (Fig. 2). Final drying is done on the sand (Fig. 3), and the fish are covered at night to keep off the fog. This part of the operation takes several days, depending upon the amount of sun, and involves constant attention but little laborious effort. Thus to exploit smelt efficiently in aboriginal times, as today, it is necessary to have people camped in reasonably large numbers nearby, although no organized group effort is needed to collect or process the fish.

Sea perch, particularly the redbait surf-perch (*Holconotus rhodoterus*), were caught aboriginally off the beaches by individual fishermen, and this practice continues today among both Indians and whites, especially in the summer. Sometimes the total catch of fish may be large—the largest I have seen weighed

75 lb. and was taken in about 4 hours by one fisherman—but this was and still is a secondary activity compared to catching smelt.

Minor Procurement Systems

Various land mammals, edible berries and plants, and ocean fish were frequently obtained by the Tolowa, although none in amounts that could approach those of the items designated here as staples. Deer and elk were hunted in the interior, and Lewis (1973:49-56) has pointed to the possible importance of burning by the Indians of this region as a means of enhancing the game resource. However, deer and elk are solitary game animals and cannot be hunted *en masse*. Stalking and pit-snares were used by individual Tolowa hunters to good effect, but



Fig. 2. Smelt being sun-dried on driftwood logs, near Smith River, California.



Fig. 3. Final stage in drying smelt. Fish are laid on platforms of sand to sun-dry during the day. At night they are covered to keep moisture off in case of fog. Smith River, California.

total amounts of meat taken in this way cannot have been great compared to even the least productive of the staple food procurement systems.

Ocean fishing, like the hunting of land mammals, was often done by individuals and may also have been a pastime during organized sea lion hunts, but the total catch was probably not overwhelming. Various sharks, hake, halibut, rockfishes, lingcod, sculpins, and other kinds of fish were caught, some from boats when the sea was calm and some directly from the rocky parts of the shoreline. Finally, the edible bulbs of camas lilies, salal berries, salmon berries, huckleberries, and other plants were collected by women during the summer months to supplement and add flavor to the overall diet.

In terms of both staple and supplemental resource procurement, the Tolowa seem to have collected just about every kind of edible food that was available to them—with a few

exceptions. Informants were emphatic about not eating bear, raccoon, skunk, or porcupine owing to a taboo based on the idea that the forelimbs of these animals looked like human hands and that there was thus something vaguely cannibalistic about eating them. Drucker's observations (1937:232) indicate similar restrictions, although his list of tabooed foods is longer and includes, in addition, dog, coyote, cougar, sea gulls, and all birds of prey, along with oddments like land-bird eggs, snakes, frogs, dove, and octopus. None of these species had the potential of being a staple food resource. However, it is interesting to note that faunal remains recovered from the protohistoric Tolowa levels excavated at the Point St. George site included black bear, raccoon, coyote, and probably sea gulls as well (Gould 1966a:81-84). This evidence suggests that perhaps these food restrictions were limited in some way and that at least some of these sup-

posedly tabooed species were consumed by the aboriginal inhabitants of this region.

TOLOWA SUBSISTENCE STRATEGY

Seasonality

The seasonal occurrences of the major staple foods are summarized in Table 1. In consulting this table, one must remember that the exact periods of availability always varied somewhat from year to year, although not greatly. Marine shellfish were available all year, but the poisonous period, especially for mussels, would in some years have eliminated

this resource during the period indicated. The dashed line for anadromous fish is intended to show that some salmon were available the year round at sea and particularly at the mouth and lower reaches of the Smith River. The fall and spring salmon runs are indicated in the table as solid blocks, but data about the time of the steelhead run are uncertain, so it has not been shown. Western sea lamprey ran up the Smith River in July and August but are not shown either, since their numbers did not approach those of the salmon. Only cormorants are indicated under Waterfowl, and only smelt are

Table 1

SEASONAL OCCURRENCE OF MAJOR (STAPLE) TOLOWA INDIAN PROCUREMENT SYSTEMS

PROCUREMENT SYSTEM	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1. Large Sea Mammals						///	///					
2. Marine Shellfish	///	///	///	///	///	///	///	Poisonous Period	///	///	///	///
3. Acorns										///		
4. Anadromous Fish	- - -	- - -	- - -	///	///	- - -	- - -	///	///	///	///	- - -
5. Waterfowl						///	///					
6. Surf Fish							///	///	///			

- 1. Large Sea Mammals**—mainly Steller sea lion (*Eumetopias jubata*), also some whales, sea otter (*Enhydra lutris*), California sea lion (*Zalophus californianus*), northern fur seal (*Callorhinus ursinus*), and harbor seal (*Phoca vitulina*).
- 2. Marine Shellfish**—mainly California sea mussels (*Mytilus californianus*), also common littleneck (*Protothaca staminea*), northern razor clam (*Siliqua patula*), rock scallop (*Hinnites mulrugosa*), Washington clam (*Saxidomus* sp.), giant chiton (*Cryptochiton stelleri*), short-spine sea urchin (*Strongylocentrotus*), etc.
- 3. Acorns**—mainly tanbark oak (*Lithocarpus densiflora*), also valley oak (*Quercus lobata*), and canyon oak (*Quercus chrysolepus*).
- 4. Anadromous Fish**—mainly King salmon (*Oncorhynchus tshawytscha*), and Coho salmon (*O. kisutch*), also steelhead (*Salmo gairdnerii*), western sea lamprey (*Entosphenus tridentatus*), and candlefish (*Thaleichthys pacificus*).
- 5. Waterfowl**—mainly cormorant (*Phalacrocorax* sp.), also various ducks, geese, rails, and murre
- 6. Surf Fish**—mainly smelt (*Spirinchus starksi* and *Allosmerus attenuatus*), also redbtail surfperch (*Holcnotus rhodoterus*).

shown under Surf Fish, since these were the principal species taken in each case.

In terms of timing, Table 1 shows that staple foods of one kind or another were available to the Tolowa continuously throughout the year. Peak periods for harvesting occurred during mid-June to mid-September (sea lions, cormorants, and smelt) and early September to early November (acorns, salmon), with the latter peak representing the only period during the year when interior resources predominated over coastal ones. Note, too, that for over six months of the year more than one staple was available in harvestable quantities. In most cases, this was true for natural species that occur close together, like acorns and salmon (oak flats invariably lie close to salmon-bearing streams), but there were occasions during some years when scheduling of resource collection became a problem. This was especially true in late August-early September, when a particularly fine smelt run might continue into the beginning of the acorn harvest. These two resources occur far enough apart geographically for it to be impossible for both to be harvested simultaneously. But scheduling problems of this kind were the exception rather than the rule, which for at least half the year was *simultaneous harvesting whenever possible*.

Storage and Scarcity

The "lean" period of the year tended, as was true in most of California, to be early spring, as Baumhoff (1963:161) notes, before the start of the spring salmon run. However, "lean" in this case does not mean famine. Informants have always agreed that there was never any famine in this area, although we know that (1) for 4-5 months of the year only a single staple, shellfish, was available in significant quantities, and (2) amounts of particular staples might vary greatly from one year to the next, something that was especially true of acorns, salmon, and smelt. The diversity of resources plus their general abundance ensured

that a natural crop failure of a staple like acorns, for example, would not undermine the economy to the extent of becoming a limiting factor. Shortages of a particular food resource may have led to temporary nutritional imbalances, but the caloric needs of the population were easily met at all times. One important way of overcoming shortages is storage, and the Tolowa possessed a well-developed technology for preparing and storing food. Shellfish, fish, and sea lion meat were all sun-dried and/or smoked in large quantities in addition to being eaten fresh. Dried meat and fish were kept in large storage baskets within the dwelling houses on the coast, as were acorns. Periodically, in sunny weather, acorns were taken out of their baskets by the women and laid on mats to dry, thus preventing or at least retarding damage from fungus and insects. Informants agree that the amounts of food thus stored were prodigious, filling many large baskets that stood atop the parapet that lined the housepit in each dwelling house.

Under these conditions, shortages, when they occurred, took place only in the context of individual families rather than throughout the society at large. That is, there could be shortages of food without famine. Such shortages were not commonplace but occurred often enough for informants to recall them (see especially Gould 1966b:77-78 for examples). According to the informants, these shortages resulted more from improvidence by the families concerned than they did from any actual shortage in the environment. Each family harvested most of its own staple foods and prepared these for storage by its own efforts. Only the hunting of large sea mammals (Procurement System No. 1) and the possible use of the *munsontun* fish weir for catching salmon (Procurement System No. 4) required families, or at least the adult males in these families, to unite their efforts, however temporarily, in food-getting activities. Similarly, there was no sharing of food between families following a natu-

ral harvest except in the case of sea lions and stranded whales, both of which are creatures too large for any one family to handle effectively or to consume on its own. This view of Tolowa subsistence agrees with the earlier observation that:

By subsistence economy is meant the exploitation of the plentiful natural resources available to any industrious individual. Although there were privately owned fishing sites, ordinarily these were used freely by any person within the village group . . . Individuals who had been lazy or inefficient in gathering food . . . were forced to buy it [i.e. with prestige goods like dentalia shell beads, red-headed woodpecker scalps, and obsidian blades] [Du Bois 1936:50],

although it is apparently contradicted by the further observation by Du Bois that:

. . . they [the Tolowa and Tututni] are not accustomed to translate the value of dried salmon or a basket into dentalia and then make exchanges whose dentalia equivalents are of equal value. In the realm of subsistence economy the Tolowa-Tututni were on a barter basis without translation into another medium [Du Bois 1936:50].

Perhaps the best way to reconcile these apparently contradictory statements is to point out that there really was no "subsistence economy" among the Tolowa above the level of the individual family—that is, a man, his wives, children, and close adherents. Except for the general division of shares of sea lion and whale meat there were no sharing or barter-based exchanges of food, although sometimes improvident families or individuals experienced shortages and were forced to "buy" food with their prestige goods.

Seasonal Movement and Resource Tenure

Only Procurement System No. 3, Acorns, required any wholesale movement of people away from the coast, and this was only for a few weeks during late fall. As mentioned ear-

lier, productive oak flats were situated only a short distance from the coast, generally between 5 and 15 miles inland, so travelling distances were never great even between the most widely-separated staple resources. In consequence, the Tolowa followed a seasonally regular, but narrowly-circumscribed pattern of movement between harvesting areas. In late summer, usually August, families moved from the large coastal villages onto the beaches to camp for several weeks while the smelt were running. Then they moved inland to various oak flats where they could collect acorns and, at the same time, fish during the fall salmon run. At the end of the acorn harvest these families would make their way individually back to the coastal villages where they remained for the remaining 9-10 months of the year.

These seasonal movements were not organized, wholesale movements of village populations. A wealthy headman generally took the initiative in such a move, but it was up to each family to move on its own. Moreover, families did not move to the beaches or the oak flats as village entities. Villages broke up in late summer and were reconstituted in the late fall upon return from the oak flats. Finally, movements away from the villages did not mean total abandonment of the villages, since women constantly travelled back and forth between the collecting areas and the villages carrying basketloads of fish and acorns to place in storage.

The seasonal pattern of village unity and dispersal is reflected in traditional concepts of land and resource tenure. Tracts of shoreline were claimed by particular villages. These tracts were well-defined, and the boundaries between them were defended, especially in cases where whales became stranded on the beaches. With one exception, every Tolowa village claimed tracts of shoreline that included both rocky headlands and sandy beach, thus ensuring that each village had access to the staple resources available in each of these microenvironments. The single exception was

the village of *?ectšuuled*, situated on a neck of land between Lake Earl and Lake Talawa, only a short distance from the ocean. In this case the lakes themselves may have furnished resources in a localized concentration sufficient to offset this village's lack of a rocky foreshore, but the argument remains speculative and is not intended to explain away this exception to the general pattern. Individuals and individual families, however, claimed ownership of particular oak groves or even specific trees as well as fishing and eeling places along the streams, and it was to these places that they moved in the late fall. There was no clear correlation between villages and interior collecting areas, and there were no bounded and defended village tracts in the interior. Individuals or families wishing to use interior resources other than their own had to seek permission from the owners, and, although informants say this permission was often granted, they also stressed that it was not granted automatically. Unfortunately, our knowledge of the rules governing such permission remains vague, although we know that there were disputes (and subsequent indemnities) arising from ambiguities of ownership or failure to obtain permission.

POPULATION AND SETTLEMENT PATTERN

Estimates of the pre-white contact population of the Tolowa vary widely, ranging from an extreme low by Cook (1943:4) of 450 individuals to extreme highs by Cook (1956:101) and Baumhoff (1963:231) of 2400 individuals. Kroeber (1925:883) estimated the pre-contact Tolowa population at 1000. By 1910 a U.S. Government census of northwestern California and southwestern Oregon revealed that only 383 Tututni and 121 Tolowa Indians remained in this region (Curtis 1907-1930:96), and it has never been possible in post-contact times to make accurate estimates of the aboriginal population of this area by means of direct enumeration. The estimate of 450 individuals

at the time of contact is certainly too low, and considering the extent of proto-historic and historic village sites in the area, the estimate of 1000 also seems too low. In terms of the somewhat subjective grounds of abundant natural resources of this region and wide extent of archaeological and historic remains, the highest estimates appear to be the best offered so far. If one accepts such high aboriginal estimates one must also accept the idea that epidemic diseases like measles and cholera introduced by white contact had a devastating impact on these populations, leading in a few years to populations reduced to a few hundred. Although it cannot be quantified in any way, informant testimony strongly supports this idea of a population catastrophe due to introduced diseases.

Baumhoff (1963:188) has suggested that the aboriginal population of the Yurok and other Klamath River groups was well below the potential carrying capacity of this region, at least without permanent structures, despite the fact that most villagers left the coast for about two months each year. These villages occupied a coastal strip that represented only a small fraction of the total area used by the Tolowa—perhaps 35 square miles out of a total of 700. Thus, if one computes an average population density of 3.43 people per square mile, one must also remember that for about 9-10 months every year the actual population density was probably more like 68.6 people per square mile, due mainly to the richness of marine resources to which this narrow coastal strip provided access. Except for occasional forays by individuals or families to hunt and fish, and the fall acorn and salmon harvest, most of the Tolowa hinterland remained unused and unoccupied most of the time.

THE NATURE OF TOLOWA SUBSISTENCE

The Tolowa and their coastal neighbors present an example of a "resource-optimizing"

subsistence system. It was a system that aimed at deriving the highest possible level of harvesting productivity without consideration of potential risk. The particular seasonal patterns of movement and residence adopted by the Tolowa, together with occasional efforts to unite above the level of the individual family in the pursuit of particular resources (sea lions and salmon), were all part of a subsistence strategy, whether conscious or unconscious, that sought to collect all harvestable resources at their time and place of maximum availability, and to a very large extent it was successful. There was little occasion for the Tolowa to be concerned with the problem of scheduling, that is, they rarely had to choose among harvesting two or more resources that appeared simultaneously in widely separated niches. Yet, at the same time, their basic staples were varied and reliable and furnished a reasonably balanced diet. Few other examples in the literature on hunter-gatherers offer such a picture of total affluence in subsistence with, at the same time, a minimum of risk. No shortages in any single resource or resource-procurement system can be pointed to as a limiting factor in either the short or long run of Tolowa economic life.

Under such optimal conditions one might expect that the aboriginal population was expanding, and indeed it may have been. Archaeological evidence in the form of increases in the number and size of sites suggests that the Indian cultures of this coastal region experienced a phenomenal growth in population during the last 2000 years. Human settlement at the Gunther Island site (Hum-67) on Humboldt Bay was well established by 1050 years ago (Heizer 1964:132), and a radiocarbon date of 310 B.C. predates the period of intensive, proto-historic Tolowa settlement at DN0-11, the Point St. George site (Gould 1972). These two dates suggest that this major expansion of population began sometime between 1000 and 2000 years ago. Additional radiocarbon dates

from the Tsurai site (Hum-169) at Trinidad Bay, Patrick's Point (Hum-118), and two sites farther north along the Oregon coast (Ti-1 and Cs-23) range between 500 and 150 years ago and serve to document the further growth and spread of human population along the northwest California-southwest Oregon coast during the last 1000 years. There is no way of knowing at this time how much of this growth was due to natural increase and how much was due to migration, but there is a good possibility that the trajectory of this growth was continuing up to the initial historic period. However, we lack vital statistics, so any attempt to model population growth against resources in this area would be purely speculative. One thing seems clear, however, and it is that whether or not the population was still expanding at the time of white contact, it had not yet reached a critical level that placed strain upon the economy.

The foregoing discussion of Tolowa subsistence is intended as a corrective to the tendency in the literature for anthropologists (and here I include myself) to focus their attentions upon the more conspicuous elements of northwestern California Indian social behavior—especially wealth-questing. But, more importantly, it is also intended as the basis for a reanalysis of these social activities. To what extent should wealth-questing and concomitant social activities among the Tolowa be regarded as adaptive behavior in the context of the total northwestern California coastal ecosystem?

Wealth-Questing as an Aggrandizive Mechanism

Because of the balanced, abundant, and varied nature of their wild staple resources, the Tolowa did not experience famine. As mentioned earlier, shortages of food did occur, but were felt only at the level of the individual and his immediate family. Since each family was able, largely through its own unaided efforts, to collect, prepare, and store its own staple and

supplemental food resources, there was no compelling need for sharing networks between families. Before we can begin to explain the presence of an aggrandizive system of resource procurement and use, we must first understand why a sharing system was not necessary. In the case of the Tolowa, it was not simply that they lived in an environment rich in natural resources but that their natural resources became available at times and places where they could be harvested economically by individuals and individual families. Aside from sea lions and some salmon, no other food procurement systems required a cooperative effort above the level of the individual family to harvest, prepare, or store staple foods. Indeed, one could argue that individual families, because of their greater flexibility, were more responsive to fluctuations in the availability of certain resources and could move quickly and easily to take advantage of them. Large cooperative groups would, in all probability, have been unwieldy and without advantage. The basis for economic success in the sphere of subsistence among the Tolowa rested almost entirely upon the efforts of individuals and individual families, and these efforts were as well or better rewarded than would have been the efforts of larger, cooperative foraging and hunting groups. The partial adoption of this latter operation in the case of ocean sea lion hunting and perhaps some salmon fishing shows that the Tolowa were ready to use cooperative techniques when it was obviously to their advantage, but that otherwise such techniques were avoided.

On the other hand, personal and family aggrandizement of food resources by means of efficient collection, preparation, and storage worked well and adequately met the needs of all but the most improvident or unlucky. Women were the primary producers in Tolowa society. Although men performed physically intense activities like sea lion and land-mammal hunting and carried out most of the tasks re-

lated to salmon fishing (especially the construction of weirs), canoe building, and house construction, it was the women who collected the bulk of the acorn harvest and who did most of the shellfish collecting. Women collected drift timber off the beaches for firewood. While men actually netted smelt in the surf, it was the women who carried the catch back to camp and took charge of drying the smelt for storage. Similarly, women prepared acorns and all other foods for storage and consumption. Thus, the amount of food a family could accumulate and store was directly dependent upon the number of women in the household. A man with several hard-working wives and daughters could store up large reserves, and not only could he use these as security against possible scarcities, but he could also commission "feasts" when he wished to recruit people to construct a large canoe or house. In a sense this was a form of redistribution of food, but this redistribution did not extend to people who were in need due to food shortages. Instead, all food was distributed with the clear expectation of immediate repayment, either in labor (as with canoe-building) or in prestige goods (as when an improvident family ran short of food). In those rare cases when a family short of food could not pay for it, it was given grudgingly as a form of charity:

If they [people short of food] were too poor to pay for it, they were given food by others but they were looked down upon. 'Anybody could do what he liked with them' [Du Bois 1936:50].

Thus a man with several industrious wives and daughters could, in time, expect his household to accumulate larger reserves of food than families with fewer active women.

Women were "working capital" in the fullest sense. As stressed elsewhere (Gould 1966b), women were a source of bridewealth that consisted of specific prestige goods—red-headed woodpecker scalps, dentalium, and obsidian

blades, to mention the more commonly circulated items. Direct exchange of prestige goods for food occurred but was uncommon. More important was indirect exchange through the purchase of women as primary producers by means of prestige goods. A man purchased a wife in the hope that she would work hard to maintain his family's domestic food supply, but he also bought rights to the bridewealth any daughters she might bear would eventually attract. Direct patrilineal inheritance, indemnities, trade, gambling, and other schemes were also important avenues to wealth in so-called prestige goods, although views have differed concerning the relative importance of these approaches to wealth and the manner of their manipulation. Du Bois (1936) distinguished between "prestige" and "subsistence" economies within Tolowa society. The prestige economy was based on transactions involving the special goods mentioned above, while subsistence was on a barter basis, with no exchanges between the two economies. Thus, Du Bois concluded, the prestige goods acquired and manipulated by the Tolowa were not all-purpose currency, to be subdivided and exchanged for goods of any kind. Drucker (1937:241) accepted Du Bois' basic distinction between prestige and subsistence goods but nevertheless argued that prestige goods were true money. He pointed out on the one hand that kin-based exchange of food could not be called a special economy, and on the other hand that prestige goods could be used by the Tolowa to buy everything that was for sale and therefore were true money. Du Bois (1936:55-56) emphasized the importance of manipulation and haggling on the part of Tolowa men to achieve wealth; Drucker (1937:242) stressed the role of direct, patrilineal inheritance as the principal means of becoming a wealthy man. In my analysis (1966b) I have accepted Du Bois' emphasis on manipulation as an avenue to wealth, but I have stressed the importance of bride-purchase as a specific form of manipulation that tends to

break down her sharp distinction between prestige and subsistence economies.

The eventual result of all these manipulations plus direct inheritance was that wealth goods as well as food became concentrated in particular households—those of wealthy men or *mīlxəšxe*—and one such wealthy man usually appeared as paramount within each village. These men were not formal chiefs, and they lacked authority in most matters. But they acted as intermediaries in marriage negotiations and indemnity settlements, and they were in a position to initiate projects like canoe- and house-building and the annual first sea lion hunt. Given the optimizing nature of traditional Tolowa subsistence procurement systems, the presence of a non-authoritarian leader in each village who could take the initiative in the few subsistence activities that required cooperative organization and who could marshal resources to construct the facilities necessary for these activities can be regarded as highly adaptive. The institution of a "wealthy man" in each village provided a higher degree of ecological fitness for Tolowa society than would a purely egalitarian system, since without some form of leadership the opportunities to harvest sea lions and salmon would have been severely limited.

Of course ecology cannot "explain" all the particular manipulations and attendant symbolism of wealth-questing among coastal northwestern California Indians. What this paper has tried to show is that the essentially aggrandizive nature of wealth-questing is inter-related in a consistent manner with the optimizing subsistence behavior of these people. Indeed, this paper has gone farther and shown that at least some aspects of wealth-questing, particularly the brideprice and the institution of the wealthy man, arise from and in turn support traditional Tolowa subsistence procurement systems. In this sense, wealth-questing, as an expanded form of a wider type of behavior I have termed "aggrandizive," can be regarded

as adaptive for hunter-gatherers living within the northwestern California coastal ecosystem. By contrast, sharing and redistributive behavior with regard to subsistence resources are more adaptive within ecosystems that contain a greater element of risk, where risk-minimizing rather than optimization is important. Placed as they are near the pole of greatest affluence and least risk within the whole spectrum of known ethnographic and historic hunter-gatherer adaptations, the Tolowa case points the way to a hypothesis that should be tested whenever possible: *Among hunter-gatherer societies aggrandizive behavior increases with respect to the total economy in direct proportion to the opportunity for optimal harvesting with minimal risk by individual family or household groups.*

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