The Fishermen of Anapua Rock Shelter, Ua Pou, Marquesas Islands

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FISHING WAS AN IMPORTANT ASPECT OF SUBSISTENCE of many Pacific communities. Ethnographic accounts, however, have tended to give an incomplete picture of fishing behavior, often overemphasizing dangerous or exciting aspects at the expense of the more mundane. In recent years, a growing number of archaeological studies, based on the careful collection and systematic and thorough analysis of fish remains, have permitted a better understanding of some aspects of fishing practices in various Pacific island groups.

This paper presents the results of the analysis of a substantial collection of fish bones from Anapua Rock Shelter, a deeply stratified site in the Marquesas. The objectives of the study were to define the character of the catch of the fishermen who frequented the shelter over a long period and to explore any possible changes through time; and then to place Anapua in a broader Marquesan and Pacific context.

THE ANAPUA ROCK SHELTER

Anapua is a rockshelter at the southern end of the island of Ua Pou in the Marquesas Islands. It is difficult to access except by sea and is known to present-day Marquesans as a "fishermen's cave." Archaeological investigations were carried out there under the direction of Ottino, starting in 1982 (Ottino 1985*a*:216–228, 1985*b*). The investigations consisted of a 13 m^2 excavation in the interior of the shelter, which exposed only the uppermost layers, and a deep *sondage* (test pit) at the junction of the flat interior and the beginning of the talus slope. The site produced a large range of faunal material, which was identified and reported by Leach et al. (1990).

The faunal material is from the sondage, which was excavated in 39 spits to a depth of almost 4 m. Fifteen stratigraphic layers were recognized. These were grouped by Ottino into five major levels, according to the nature of the sedi-

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Asian Perspectives, Vol. 36, No. 1, © 1997 by University of Hawai'i Press.

TABLE 1. LEVELS, LAYERS, AND SPITS AT ANAPUA ROCK SHELTER

DESCRIPTION	LEVEL	LAYERS	SPITS
Ashy, charcoal-stained deposits with clearly defined hearths and earth ovens. European material present	V	15b, 15a	1 to 6
Fine, ashy deposits, little or no evidence of living surfaces or structures	IV	14b, 14a, 13	8 to 17
Largely sterile layer of scree and colluvium	III	12	19
A deep deposit of ashy, charcoal-stained layers alternating with colluvium	II	11 to 3	21 to 36
Sterile deposit resting on the rock floor of the shelter	I	2 to 1	37 to 39

Note: Spits 7, 18, and 20 are excluded because they included material from more than one level.

ments. The correlation between arbitrary spits, stratigraphic layers, and major levels is shown in Table 1.[1] The material excavated from the sondage was sieved through 2 mm mesh.

Ottino obtained a radiocarbon date of 2100 ± 95 B.P. on charcoal from deep in the site. A sample of shell from the same level has been dated to 770 ± 50 B.P. (CRA 1180 ± 50, NZ 7527, Ottino 1992:57). Ottino (1992:210) regards the earlier result as more acceptable. Three other radiocarbon dates from higher up the stratigraphic sequence have not yet been published.

The bulk of the faunal material consists of fish and invertebrates (shellfish and crustaceans). Other bone was scarce throughout the deposits. A small number of bird bones are all of seabird species (Leach et al. 1990:46). A MNI (Minimum Number of Individuals) of 19 rats (most or all *Rattus exulans*) was calculated from 106 bones distributed from spit 7 to spit 35 (Leach et al. 1990:25). Other bones were very few and fragmentary and no chronological changes can be detected. Pig was definitely present in levels V to II (to spit 26), dog and turtle in levels IV and II (to spit 32), and seal in levels IV, III and II (to spit 21) (Leach et al. 1990:56).

METHOD OF FISH BONE ANALYSIS

The method used for the analysis closely follows the technique developed in New Zealand for the treatment of archaeological fish bone assemblages from Pacific islands generally. This has been described elsewhere (Leach 1976; Leach and Davidson 1977; Leach and Ward 1981), so only a few details need be given here.

For the purpose of analysis, an *assemblage* is defined as the contents of any single excavation unit. Thus, all bone from one excavation square and one excavation level (in this case "spit") is designated as an assemblage. Minimum Numbers of Individuals (MNIs) are calculated with reference to this assemblage unit.

Each assemblage was sorted into identifiable and not identifiable piles, and all material was rebagged and kept. The identifiable fragments were sorted anatomically and again rebagged. Taking each part of the anatomy in turn, bones were then sorted into species, genera, and/or families and identified with reference to the comparative collection, which contains mounted bones of over 300 Pacific species. Taxonomy largely follows Munro (1967). All information was entered

TABLE 2. NUMBER OF FISH BONE IDENTIFICATIONS BY ANATOMY

ANATOMY	LEFT	RIGHT	TOTAL
Dentary	84	77	161
Articular	61	49	110
Quadrate	68	81	149
Maxilla	45	52	97
Premaxilla	57	65	122
Subtotal	315	324	639
Special Bones	–	–	791
Grand total			1430

into a computer database that has been specifically developed for fish bone studies in the Pacific region (see Leach 1986). A few bones were found that could not be matched in the comparative collection, even to family level. These were entered as Species A, Species B, etc. They appear in Tables 3, 4, and 5 as "Teleostomi."

The calculation of minimum numbers follows the general technique of Chaplin (1971) and is further discussed by Leach (1986). No attempt is made to increase MNI by taking into account any observed size mismatches. In the tables that follow, use is made of Shannon's H statistic to evaluate the diversity of fish catches. Its method of calculation and details of the range of uses of the statistic in archaeology are described by Haedrich (1975), Leach (1978, 1986), Rao (1984), Watanabe (1972), and Wilhm (1968).

The identified bones are listed according to anatomical parts in Table 2. Altogether, 1430 bones have been identified. More than half are "special bones," such as caudal peduncles and pharyngeal bones. Of the standard paired cranial bones, approximately equal numbers were identified from one component to another and on each side of the body.

Thirty-six of the 39 spits excavated at Anapua contained fish bones. Since the number of fish in any one of these excavation units is quite small, it is difficult to identify significant changes through time (if any) using these small assemblages. For this reason, the spits were combined into the previously defined major levels for this analysis. No fish bones were recovered from the sterile deposits of the deepest level (I), so the analysis is confined to Levels II to V. Three excavation spits (7, 18, and 20) contained material of mixed or uncertain provenance and these have been excluded from the analysis.

RESULTS

The MNI and percentage of catch by fish families for each of the four occupation levels are given in Tables 3 and 4 (Fig. 1). The fish families are grouped according to probable catching methods in Table 5. The basis for these groupings is discussed in more detail in Leach, Fleming et al. (1988). It is recognized that these groupings do not take account of local ecology or particular local catching methods (some of which are mentioned below). They are useful, nevertheless, because they do provide a standard basis for comparisons across a wide range of Pacific fish bone assemblages.

TABLE 3. FISH MNI BY FAMILY FOR FOUR MAIN STRATIGRAPHIC LEVELS

	LEVEL				
FAMILY	II	III	IV	V	TOTAL
Scombridae	67	1	38	3	109
Serranidae	23	1	27	5	56
Holocentridae	14	1	35	3	53
Balistidae	21	0	15	3	39
Lutjanidae	21	0	13	2	36
Lethrinidae	9	1	13	1	24
Scaridae	6	0	13	1	20
Carangidae	6	0	9	1	16
Elasmobranchii	6	0	9	1	16
Belonidae	1	0	8	1	10
Acanthuridae	2	2	6	0	10
Ostraciidae	4	0	5	1	10
Coridae/Labridae	4	0	3	0	7
Mullidae	5	0	1	0	6
Diodontidae	2	0	4	0	6
Lamniformes	1	0	4	0	5
Aulostomidae	2	0	1	0	3
Scorpaenidae	2	0	1	0	3
Kyphosidae	1	0	1	0	2
Aluteridae	1	0	1	0	2
Teleostomi	1	0	1	0	2
Muraenidae	0	0	1	0	1
Caesiodidae	0	0	1	0	1
Nemipteridae	0	0	1	0	1
Platacidae	0	0	1	0	1
Tetrodontidae	0	0	1	0	1
Totals	199	6	213	22	440
Shannon's H	3.3	2.3	3.8	3.2	3.6

Several probably related changes through time are indicated in the results. For example, there is a decrease in the relative abundance of tuna. In Level II, tuna amount to 34 percent of the catch; this falls to as low as 14 percent by Level V, with intermediate values consistent with this trend. The grouper types of fishes appear to follow the opposite trend, increasing in importance from 12 percent in Level II to 23 percent in Level V; again the intermediate values are reasonably consistent with this. The Holocentridae family may also follow this pattern. It is important to realize that any measure of abundance, such as a percentage statistic, has a confidence range associated with it. These suggested changes in relative abundance must be examined alongside their appropriate error margins. This is indicated in Table 4, in which we see that significant changes are only evident from Level II to Level IV (Fig. 2). All other error margins are too large for trends to be confirmed.

When the fish are grouped according to probable catching methods, no obvious and consistent pattern of change is indicated. We might expect that the change from tuna to grouper would show in the catch method figures as a change from lure fishing to baited hook fishing. However, there is not much

TABLE 4. FISH PERCENTAGES[a] BY FAMILY FOR FOUR MAIN STRATIGRAPHIC LEVELS

	LEVEL			
FAMILY	II	III	IV	V
Scombridae	33.67 ± 6.82	16.67 ± 44.32	17.84 ± 5.38	13.64 ± 17.41
Serranidae	11.56 ± 4.69	16.67 ± 44.32	12.68 ± 4.70	22.73 ± 20.76
Holocentridae	7.04 ± 3.80	16.67 ± 44.32	16.43 ± 5.21	13.64 ± 17.41
Balistidae	10.55 ± 4.52	0.00 ± 8.33	7.04 ± 3.67	13.64 ± 17.41
Lutjanidae	10.55 ± 4.52	0.00 ± 8.33	6.10 ± 3.45	9.09 ± 14.95
Lethrinidae	4.52 ± 3.14	16.67 ± 44.32	6.10 ± 3.45	4.55 ± 11.46
Scaridae	3.02 ± 2.63	0.00 ± 8.33	6.10 ± 3.45	4.55 ± 11.46
Carangidae	3.02 ± 2.63	0.00 ± 8.33	4.23 ± 2.94	4.55 ± 11.46
Elasmobranchii	3.02 ± 2.63	0.00 ± 8.33	4.23 ± 2.94	4.55 ± 11.46
Belonidae	0.50 ± 1.23	0.00 ± 8.33	3.76 ± 2.79	4.55 ± 11.46
Acanthuridae	1.01 ± 1.64	33.33 ± 53.85	2.82 ± 2.46	0.00 ± 2.27
Ostraciidae	2.01 ± 2.20	0.00 ± 8.33	2.35 ± 2.27	4.55 ± 11.46
Coridae/Labridae	2.01 ± 2.20	0.00 ± 8.33	1.41 ± 1.82	0.00 ± 2.27
Mullidae	2.51 ± 2.43	0.00 ± 8.33	0.47 ± 1.15	0.00 ± 2.27
Diodontidae	1.01 ± 1.64	0.00 ± 8.33	1.88 ± 2.06	0.00 ± 2.27
Lamniformes	0.50 ± 1.23	0.00 ± 8.33	1.88 ± 2.06	0.00 ± 2.27
Aulostomidae	1.01 ± 1.64	0.00 ± 8.33	0.47 ± 1.15	0.00 ± 2.27
Scorpaenidae	1.01 ± 1.64	0.00 ± 8.33	0.47 ± 1.15	0.00 ± 2.27
Kyphosidae	0.50 ± 1.23	0.00 ± 8.33	0.47 ± 1.15	0.00 ± 2.27
Aluteridae	0.50 ± 1.23	0.00 ± 8.33	0.47 ± 1.15	0.00 ± 2.27
Teleostomi	0.50 ± 1.23	0.00 ± 8.33	0.47 ± 1.15	0.00 ± 2.27
Muraenidae	0.00 ± 0.25	0.00 ± 8.33	0.47 ± 1.15	0.00 ± 2.27
Caesiodidae	0.00 ± 0.25	0.00 ± 8.33	0.47 ± 1.15	0.00 ± 2.27
Nemipteridae	0.00 ± 0.25	0.00 ± 8.33	0.47 ± 1.15	0.00 ± 2.27
Platacidae	0.00 ± 0.25	0.00 ± 8.33	0.47 ± 1.15	0.00 ± 2.27
Tetrodontidae	0.00 ± 0.25	0.00 ± 8.33	0.47 ± 1.15	0.00 ± 2.27
Totals	100.0	100.0	100.0	100.0

[a] The confidence limits are 95 percent margins and were calculated using the technique described by Leach and de Souza (1979).

indication of this when the other species caught by these methods are included. On the whole, the emphasis given to different catching methods seems to have stayed fairly constant over time, even though different species appear to have been caught.

THE GENERAL CHARACTER OF FISHING AT ANAPUA

The fishermen's catch at Anapua was unusual in our experience of Pacific fish bone assemblages. The dominant fish taken were tuna, members of the Scombridae family (nearly 25 percent of the overall catch and nearly 34 percent of the early Level II catch). The degree to which this is unusual is illustrated in Figure 3, which shows the overall proportion of tuna in 21 site or island assemblages analyzed strictly according to the methodology outlined above. Only one other site remotely approaches Anapua in this respect: the Fa'ahia site on Huahine in the Society Islands, which was also regarded as exceptional in this respect when

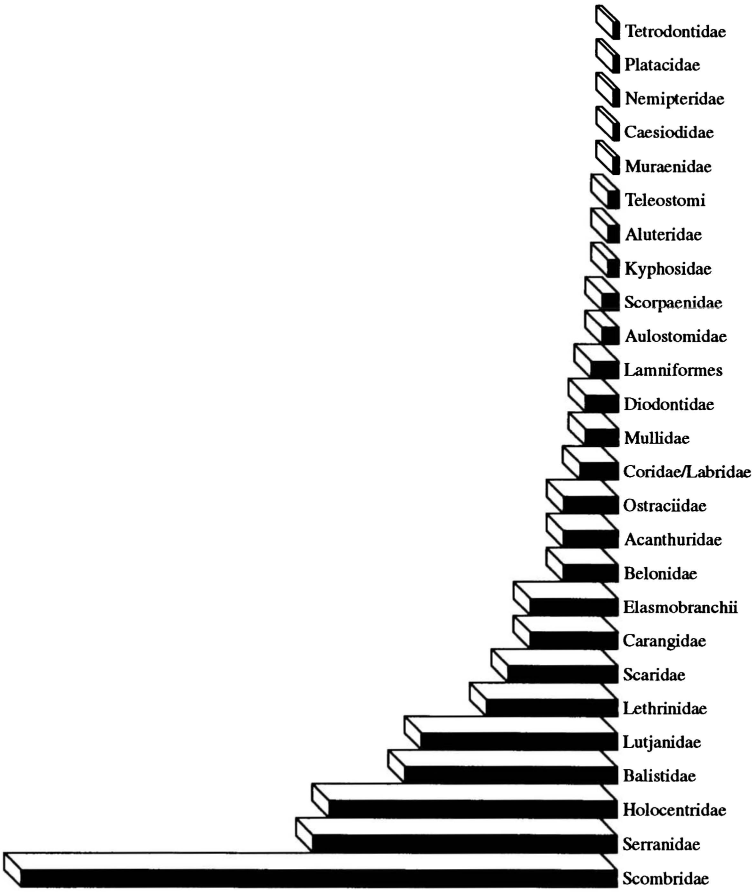

Fig. 1. Relative abundance of different families of fish at Anapua (all stratigraphic levels combined). Tuna dominate the catch, followed by grouper, and then squirrelfish.

analyzed (Leach, Intoh, and Smith 1984). It is worth noting that the upper levels of Anapua have a higher proportion of Scombridae than any other known site except Fa'ahia.

It is not known which species of tuna were being caught by the Anapua fishermen, but the bones mostly came from small individuals. It was therefore considered worthwhile to quantify this if possible. Unfortunately, there is inadequate comparative material at present for reconstruction of length and weight of the live fish represented, but the figures presented below will enable this to be done in future.

A very diagnostic bone of all the fast-swimming pelagic predators such as the various tuna species, marlin, swordfish, and dolphinfish is the caudal peduncle. This is also a very robust bone, which is especially suitable for measurement. A sample of complete bones was measured with digital calipers to the nearest 0.1 mm. The dimension measured is shown in Figure 4 and the histogram of measurements in Figure 5. The statistics obtained are given in Table 6.

TABLE 5. FISH PERCENTAGES BY CATCH METHOD

	LEVEL				
LIKELY CATCH METHODS	II	III	IV	V	TOTAL
Netting	17.1	33.3	18.8	22.7	18.4
Scaridae					
Acanthuridae					
Balistidae					
Aluteridae					
Ostraciidae					
Demersal Baited Hook	31.2	33.3	27.2	36.4	29.5
Serranidae					
Lutjanidae					
Lethrinidae					
Mullidae					
Coridae/Labridae					
Nemipteridae					
Pelagic Lures	37.2	16.7	25.8	22.7	30.7
Belonidae					
Carangidae					
Scombridae					
General Foraging	10.6	16.7	20.7	13.6	15.7
Holocentridae					
Aulostomidae					
Kyphosidae					
Scorpaenidae					
Diodontidae					
Caesiodidae					
Tetrodontidae					
Basket Traps	–	–	0.5	–	0.2
Muraenidae					
Opportunistic	3.5	–	6.1	4.5	4.8
Elasmobranchii					
Lamniformes					
No Strong Opinion	0.5	–	0.9	–	0.7
Teleostomi					
Platacidae					

Both skewness and kurtosis are significantly positive ($p = .05$) and this non-normality is evident in the histogram also. This suggests that more than one species is present in the assemblage. The smaller individuals could be one or more of a number of species, such as *Katsuwonus pelamis* (skipjack), *Sarda* sp. (bonito), or perhaps *Rastrelliger* sp. (mackerel).

The next most abundant fish taken were members of the Serranidae family (13 percent). This is a diverse group of fish in the Pacific and includes many kinds of rock cod, grouper, coral trout, and so on. These fish tend to be bottom feeders and will readily take a baited hook in deeper waters, although some will take a slow, deeply trolled lure.

About as numerous in the catch as the foregoing were Holocentridae or squirrelfish/soldierfish (12 percent). This is a group of relatively small fish, with a considerable number of species. Most are nocturnal, retreating into holes and

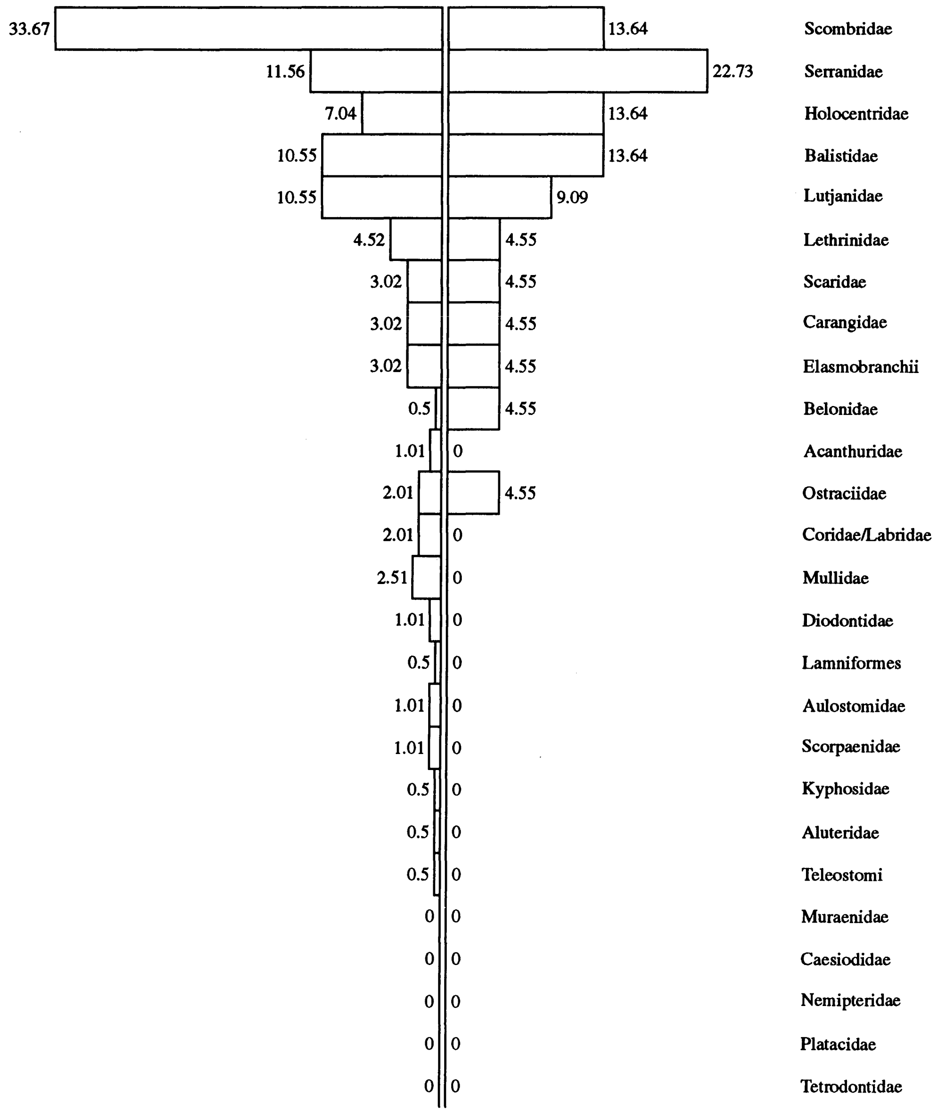

Fig. 2. Changes in relative abundance of different fish families from Level II to Level V at Anapua. The 95 percent confidence limits are given in Table 3. The most significant change through time is a decline of tuna in the catch.

crevices in shallow water during the day (Munro 1967 : 139). The mouth is of moderate size for a small fish, and they are readily taken on a baited hook. Given their nocturnal habits, it is possible that this fish was usually caught by deliberate night fishing with baited hook, although they could also be caught by general foraging activities in shallower water. Rolett (1989 : 211–212) describes three contemporary night fishing practices using baited hooks and lures in the Marquesas specifically targeted at these fish.

Members of the triggerfish (Balistidae) family were the next most frequently

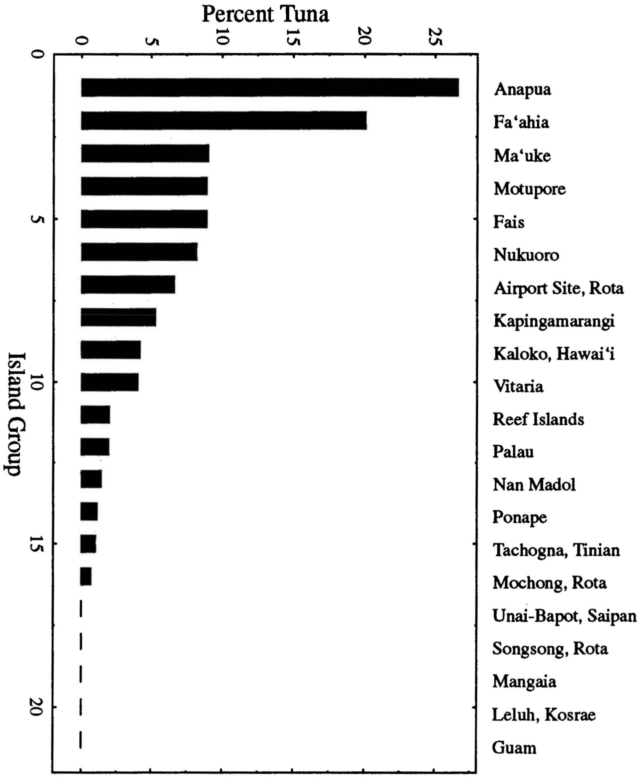

Fig. 3. The proportion of tuna in the total catch in 21 Pacific fish bone assemblages. Sources as follows: Fa'ahia, Huahine (Leach, Intoh, and Smith 1984); Ma'uke, Ana'io (Leach 1989); Motupore (McMurtry 1986); Fais (Leach et al. 1994*a*); Nukuoro and Kapingamarangi (Leach and Davidson 1988); Rota Airport site (Davidson and Leach 1988); Kaloko, Hawai'i (Leach 1991; Leach, Horwood, and Smith 1988); Vitaria, Taputa'a-Pito (Leach, Intoh, and Chazine 1984); Reef Islands, Santa Cruz (Green 1986); Palau (Masse 1982, 1986); Nan Madol, Ponape (Leach et al. 1996); Ponape (Bruce Masse, personal communication 1982); Tachogna, Tinian (A. Piper, personal communication 1986); Mochong, Rota (Leach, Fleming et al. 1988); Unai-Bapot, Saipan (Piper, personal communication 1986); Songsong, Rota (Leach et al. 1987); Mangaia (Leach et al. 1994*b*); Leluh, Kosrae (Leach, Davidson et al. 1988); Guam (J. Craib, personal communication 1982).

caught (9 percent). These fish are feeble swimmers, mainly solitary in habit, and seek shelter, particularly at night, by wedging themselves in crevices with the aid of their erectile spine (Munro 1967:557). They are carnivorous, feeding on a wide range of bottom-feeding animals including crabs, echinoderms, corals, and small fishes, using their powerful jaws to crush prey (Myers 1991:257). These fish have very small mouths and therefore are most commonly caught by netting, although some may be caught on very small hooks. Rolett (1989:228) notes that all the examples documented in his ethnoarchaeological study of contemporary fishing practice in the Marquesas were taken by inshore fishing with baited hook.

Another unusual feature of the Anapua fish catch is the general lack of parrotfish (Scaridae) in the assemblages (less than 5 percent). These fish are normally the mainstay of fish diet for Pacific peoples (Fleming 1986). Since they are closely associated with coral, both in terms of habitat and diet, their low numbers at Ana-

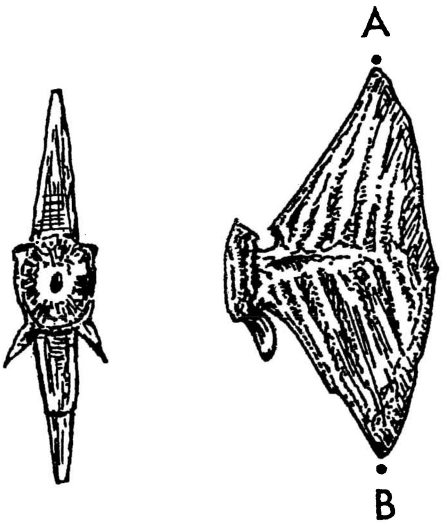

Fig. 4. The caudal peduncle of tuna showing measurement (A–B) taken for size frequency analysis.

pua may not be surprising, since coral reefs are fairly rare in the Marquesas and are largely confined to sheltered bays.

It is interesting that Shannon's H statistic rises considerably from Level II to Level IV, where the most sizeable assemblages are located and which therefore produce the most reliable statistics. The change of H from 3.3 to 3.8 shows that the range of fish types in Level IV is significantly broader than in the earlier period.

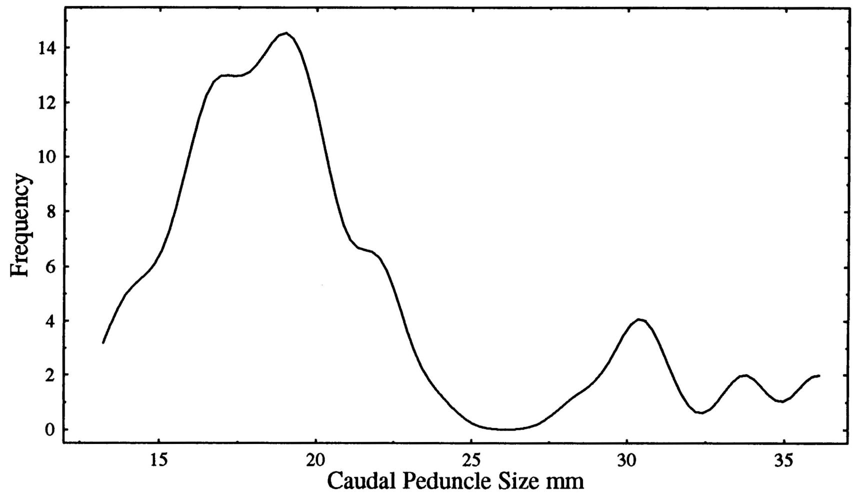

Fig. 5. Size frequency histogram of tuna caudal peduncle measurements, calculated by convolving the raw distribution with an ideal Gaussian filter (G. Wyvill, personal communication 1995). This shows that more than one species is likely to be present in the assemblage.

TABLE 6. DIMENSIONS OF CAUDAL PEDUNCLES OF TUNA FROM ANAPUA

Sample size	64
Range of Values	13.0 to 36.1
Mean	20.3 ± 0.7
Standard Deviation	5.6 ± 0.4
Coefficient of Variation	27.6 ± 2.4
Skewness g1/w1	1.3 and 4.0
Kurtosis g2/w2	4.0 and 2.1

ANAPUA AND MARQUESAN FISHING

Information about fish catches from other Marquesan sites is limited. An interesting comparison can be drawn between Anapua and Hanamiai on Tahuata, some 50 km from Anapua. Hanamiai is a stratified occupation site with a well-dated sequence that began about A.D. 1000 and continued into the historic period. The fish bone assemblage is considerably smaller than that from Anapua (495 identified bones compared with 1430) and the analysis is not presented in a directly comparable way (Rolett 1989: 224). Even so, there are some striking parallels.

Scombridae are easily the most numerous fish in the overall assemblage from Hanamiai and, as at Anapua, appear to show a decline through time. Scaridae are relatively unimportant throughout. Here the most notable similarities cease. Serranidae, Holocentridae, and Balistidae are not as important at Hanamiai as Belonidae, Lutjanidae, and Sphyraenidae (which are not present at Anapua).

Rolett interprets the Hanamiai fish analysis to reflect "a decline over time in the frequency of bones representing offshore deep-sea and pelagic fishes offset by ... an increase over time in the frequency of remains of inshore fishes" (1989: 239). He argues that the most marked change is the decline in pelagic fishing, which at Hanamiai occurred some 300 years after initial occupation (i.e., around 700 B.P.).

Rolett also argues that the decline in pelagic fishing is reflected in a decline in trolling hooks. The proportions of lure shanks and points to one-piece hooks decline from 36/103 and 3/13 in the lower zones at Hanamiai (where bones of pelagic fish comprise 25–35 percent of the total fish bone) to 2/56 in the upper zones (where bones of pelagic fish are less than 8 percent of the total). Ottino (1992: 58) has pointed to a similar change at Anapua, but the smaller number of hooks at Anapua (139 parts of one-piece hooks and 14 others, not all from excavated contexts) makes this a less convincing case. It would also be fair to say that most archaeologists, given the fish hooks but not the fish bones, would be unlikely to predict that pelagic fish were unusually important at Anapua.

Dye (1990: 74) published identifications of fish remains from three other Marquesan sites: early and late deposits at Hane, the early site of Hanatukua, and the late site of Hanapete'o. Unfortunately, the numbers of identified bones are small and include significant numbers of elements such as Diodon spines and shark teeth, which tend to give a distorted impression of the probable numbers of fish represented. Insofar as it is possible to judge from these small samples, Scombridae were not very important in these sites and were outnumbered by Serranidae in both early and late periods. Even so, Dye argues for a decline in pelagic fishing, mainly on the basis of a decline in elasmobranchs and Carangidae from early to late periods. However, Sweeney et al. (1993) challenged Dye's conclusions about the fish remains from Hane, arguing that the existing evidence did not support a change in fishing practice from the early to late periods. Dye (1996) in turn has disputed their claim.

In his earlier paper (1990), Dye drew on historical evidence to paint a very gloomy picture of the late Marquesan fishing industry, in which not only pelagic fishing but almost all kinds of fishing were in decline. In this respect it is interesting to note that fish remains were relatively few in the uppermost horizons of both Hanamiai and Anapua. At Hanamiai, Rolett has persuasively argued that the paucity of fish remains in the upper horizon is due to a change in site function from residential to ceremonial. This is not the case at Anapua, which is and apparently always was a fishermen's cave like Hanapete'o. However, it should be noted that the intensive cooking deposits that comprise Level V at Anapua are different in nature from the earlier layers. Not only did they contain relatively few fish, but they yielded no rat bones, only three fragments of bird bone, and a Minimum Number of Elements of four mammal bones (Leach et al. 1990:44–46, 57). At least part of this level belongs to the post-European period.

The Anapua fish bone analysis is an important addition to the slender but suggestive evidence about Marquesan fishing. The catch of the Anapua fishermen, although unusual in the wider Pacific, shared some of its most characteristic features with the catch at Hanamiai. Both sites suggest a decline in tuna fishing through time and hint at a general decrease in fishing in the late period. Differences between these sites and those analyzed by Dye may reflect inter-island or chronological differences, or they may be the result of the vagaries of collection, sample size, and curation. This can only be determined by future work. There are important hypotheses to be explored: both the suggestion from all sites examined that there was a decline in off-shore fishing, and Dye's argument that at the time of early European contact the entire Marquesan fishing industry was in serious decline. Ottino (1992:214) has suggested that archaeological evidence may not reflect the true situation, particularly with respect to the importance of bonito fishing.

At Anapua there is no evidence (in the tiny samples available) of an increase through time in exploitation of terrestrial animals. The site has nothing to contribute to the ongoing debate over the hypothesis first advanced by Kirch (1973) about broad changes in Marquesan subsistence.

ANAPUA AND PACIFIC TUNA FISHING

Bonito fishing is firmly entrenched in the imagination of scholars and lay people alike as one of the most important activities of Pacific fishermen. This view owes something to the classic work of Nordhoff (1930), but has been supported by many other ethnographic works. We have argued elsewhere that more game fish were caught in the men's house than in reality (Leach and Davidson 1988), and this view is supported by the data presented in Figure 3 above. We do not deny the great sociological importance of tuna and other pelagic fish, but we want to query whether they were of comparable economic importance in most islands.

Occasionally, a site or an assemblage is encountered that does appear to reflect an emphasis on tuna fishing, which matches the expectations created by Nordhoff and others.

Anapua is certainly such a site and it would appear that Hanamiai is another. It may be significant that Fa'ahia is yet another. Although the dating of Anapua remains controversial, the early zones at Hanamiai appear to be broadly contemporary with Fa'ahia and to belong to a period when, according to some writers (e.g., Walter 1990), inter-island voyaging within central East Polynesia may have been more common than it was in later times. It would not be surprising if off-shore fishing flourished in conjunction with a greater level of inter-island travel.

However, on present evidence, tuna fishing was not characteristic of central east Polynesian fishing generally at this time. The proportion of Scombridae is not high in other central east Polynesian assemblages we have examined; nor do these fish appear to have been important in the large and well-studied assemblage from the Moturakau shelters on Aitutaki (Allen 1992:195). Allen has argued for a decline in *angling* in Aitutaki, relating this to a decline in pearl shell but emphasizing the complexity and interrelatedness of changing fishing and other subsistence strategies. This serves to underline the unusual nature of the central east Polynesian sites in which tuna fishing was important and the need for a better understanding of the context in which this took place.

CONCLUSIONS

This analysis has shown that the catch of the fishermen of Anapua was unusual in several respects. First, the overall proportion of tuna in the site is high, but it declined from about 34 percent of all fish taken in the early period to only 13 percent by the upper (later) levels. Grouper fishing followed the opposite direction, increasing in importance from 12 percent to 23 percent over the same period. Tuna is a high prestige fish, but the accumulating evidence from a range of archaeological sites suggests that very few prehistoric fishermen in the Pacific managed to catch it in any quantity. The main species taken at Anapua was a relatively small variety, possibly skipjack or bonito.

Second, parrotfish are rare at Anapua, whereas in most other parts of the Pacific, they are the mainstay of fish diet. The low proportion reflects the local environment where coral, essential for Scaridae habitat and diet, is rare.

Anapua is not unique in the Marquesas. The fishermen's catch at Hanamiai also contained relatively high numbers of tuna and low numbers of parrotfish. However, limited evidence from other Marquesan sites suggests that successful tuna fishing was not common. Elsewhere, only Fa'ahia in the Society Islands stands out as another place where tuna fishing was significant.

NOTES

1. Spit numbers used in the present analysis follow those initially illustrated by Ottino (1985*b*:37, Fig. 2) rather than the revised numbers subsequently published (Ottino 1992:208), which are in reverse order.

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ABSTRACT

Analysis of fish bone from Anapua indicates that the fishermen who used this rock shelter over a long period were unusual among Pacific island fishermen. Their catch initially contained a high proportion of tuna. Although tuna appear to have declined in importance through time at the site, they remained a significant component of the catch even in the most recent levels. In contrast, the grouper types of fish followed the opposite trend over the same period. Keywords: Oceania, Polynesia, Marquesas Islands, Ua Pou, prehistory, archaeology, archaeozoology, morphometric osteology, fauna, fishing.