

Fishing for *Anadara*: A case study of Ucunivanua village in Verata, Fiji Islands

Alifereti Tawake¹, Veikila C. Vuki² and William G. Aalbersberg¹

Introduction

Pacific Island coastal communities have traditionally obtained the bulk of their protein and income from the sea (Zann and Vuki 2000). They often had no alternative. However, the increase in human population, political instability and the high demand for cash income in recent decades (driven by various socioeconomic factors) has increased the fishing pressure on marine resources.

Several socioeconomic studies of fishing communities in Verata District (Passfield 1997; Vunisea 1996) and other parts of Fiji (Hoffman 2002a, b; Davis et al. 1998; Mathews 1993; Veitayaki 1990) have demonstrated the relationship between the increasing harvesting trend of inshore fisheries (particularly of sessile marine invertebrate) and socioeconomic changes. Passfield (1997) suggested that the lack of information on targeted coastal fisheries, such as *Anadara* clams inhibits opportunities for successfully managing and sustaining local fisheries. *Anadara* clams are found on mudflats.

The *Anadara* fishery continues to be an essential fishery in many coastal villages in Fiji, particularly Ucunivanua in Verata. Although this is primarily a subsistence fishery involving mainly women and children, it has consistently provided for the basic necessities of village households throughout the year. *Anadara* was also the high chief of Verata's food totem and was an important economic resource in the village (Vunisea 1996).

Ucunivanua villagers have expressed concern that due to the increasing number of fishers harvesting *Anadara* clams, and the increasing catches of fishers that are sold and consumed, *Anadara* stocks may be on their way to overexploitation. As a result, the Fiji Department of Environment and the University of the South Pacific (USP) collaborated with the South Pacific Action Committee for Human Ecology and Environment (SPACHEE) and the Biodiversity Conservation Network (BCN) to try and find solutions to managing the fishery. They jointly conducted participatory workshops in the district to create community awareness of the fishery.

Since 1995, the *Anadara* fishery has been the focus of efforts by the Ucunivanua people in trying to manage this fishery for their livelihood. Therefore, this study was undertaken to gather information on the fishery in order to manage it as a valuable source of income and as an important food source. We gathered information on women's participation in the *Anadara* fishery and its importance to villagers' diet. The processing methods used by women were also described. The socioeconomic significance of *Anadara* and approaches to fisheries management was developed in order to address this particular fishery's management issues.

Study area

This study focused on Ucunivanua village, one of the major suppliers of seafood to the Suva market (Rawlinson et al. 1992). It is located in the coastal district of Verata within the province of Tailevu on the eastern shore of Viti Levu (Fig. 1). A primary school is also situated near the village.

Ucunivanua is a prime example of a community with a strong sense of communal activities. The economy is primarily based on fisheries, agriculture and a few formal employment opportunities. There were four small cooperative shops, five fishing boats and four registered licensed fishers with outboard motors in 1999 and these help put the *Anadara* fishery in context. The other types of commercial operations were seaweed farming and middlemen buying fishery products.

Ucunivanua residents have access to the area by an unpaved feeder road leading off from a junction 20 km north of Nausori along the Kings Road. There is a daily bus service from Ucunivanua village to Suva and Nausori markets.

The fishing grounds are shared with other neighbouring villages and districts. The inshore area consists of important habitats, including riverbanks, seagrass beds, mangroves, and fringing and patch reefs. Ucunivanua has an extensive intertidal area enclosed by fringing reefs with patches of mangrove forests lining the shoreline. The intertidal sandflats

1. Institute of Applied Sciences, University of the South Pacific, PO Box 1168, Suva, Fiji

2. Marine Laboratory, University of Guam, Mangilao, Guam 96913



Figure 1. Ucinivanua Village in eastern Viti Levu

are one of the commonly targeted habitats for *Anadara* fishing. *Anadara* is important for subsistence living and increasingly, to generate income.

In 1999, the total resident population of Ucinivanua was 338 (170 males and 168 females) and 68 households. A total of 52 households were interviewed about their involvement in the *Anadara* fishery.

Women's participation in the *Anadara* fishery

Women and school children (under 15) made up 65% of Ucinivanua's total resident population. All respondents interviewed confirmed that women and school children were actively involved in the *Anadara* fishery. It was also established from earlier studies (Vunisea 1996) and from preliminary investigations that all women were prime fishers, targeting marine resources, particularly *Anadara*, in the intertidal areas. Pre-teenaged daughters and young children often accompanied their mother.

Up to four or five women and children per household were involved in collecting shellfish. *Anadara* was collected almost exclusively by women and children (under 15 years of age). School children were encouraged to accompany their mothers and female relatives to help supplement their household income. Elderly women up to the age of 60 also contributed to the household by gleaning for *Anadara* and other marine organisms for their own consumption. Other fisheries resources included sea cucumbers, seaweed, lobsters and octopus. Several sea cucumber species (*Holothuria atra*, *H. scabra* and *Stichopus chloronotus*), giant clams (*Tridacna squamosa*, *T. maxima* and *T. gigas*), various reef fish, lobsters

and octopus, and maiden hair seaweed (*Hypnea* sp.) were also harvested. Fisherwomen, particularly older ones, have extensive local knowledge of intertidal areas.

After gleaning, women process the clams by washing them thoroughly to remove the mud and sand. They are sorted to marketable sizes and the larger *Anadara* are left in tidal pools near the village to soak until market days. The smaller sizes are processed for family and household consumption. The women process *Anadara* by cleaning them and removing the flesh with a knife. The clam meat is then marinated in lemon juice or boiled before consumed. Some are left to dry or are soaked in buckets of seawater for a day before being eaten.

Women were solely responsible for marketing at the Nausori or Suva markets. The *Anadara* were sold in a heap, ranging from 2.0–2.5 kg, for FJD 2.50. Other marine species were also sold with *Anadara*, including seahares, crabs, octopus, seaweed, giant clams, beche-de-mer and fish.

Dietary importance of *Anadara*

Anadara was consumed at least twice a week by each household surveyed: 42% of all households in Ucinivanua consume *Anadara* four times a week. Some households consumed *Anadara* twice a day. *Anadara* were mostly eaten raw after being marinated in lemon juice, or boiled (Table 1). In 35% households, raw *Anadara* marinated in lemon juice (called *kokoda*) was commonly served as either the main meal or side dish. About 42% of households boiled (*vakavuso*) *Anadara* in their shells, while the

other 2% cooked *Anadara* in coconut milk either in their shells or without the shells.

Table 1. Common ways of eating *Anadara* in Ucunivanua (N = 52 households).

Methods	Percentage of households who consume <i>Anadara</i> using a particular cooking method
Marinated in lime juice (<i>kokoda</i>)	35%
Boiled (<i>vakavuso</i>)	42%
Cooked in coconut milk (<i>vakalolo</i>)	23%

Anadara provides a consistent source of protein and iron for Ucunivanua people. The average six-member household consumes approximately 98 *Anadara* per meal (3.1 kg). Based on the nutritional value³ analyzed in this study, the total edible weight was 459 g per meal, with an average daily intake for a household member of 12 g of protein and 17 mg of iron. The annual harvest was estimated at around 364,439 clams, or 16,675 kg for the entire village.

Approximately 40% of Fiji's population suffers from anaemia (Aalbersberg 1991), a disease that is associated with a lack of iron in the blood. Because of this, iron levels were analyzed to find out whether there were sufficient levels of iron found in *Anadara*. The values were high, ranging from 189 mg kg⁻¹ to 255 mg kg⁻¹.

Iron (II) was more soluble in the acidic conditions of the intestine (Coultate 1996). The marinated *Anadara* in lemon juice increased the acidic conditions (pH~6). With the presence of the reducing agent (vitamin C), iron (II) was favoured. This increased the bioavailability of iron to the human body when consumed. These acidic conditions also further reduced the amount of bacteria (*Escherichia coli*) in *Anadara* (Naqasima 1996).

Socioeconomic significance of *Anadara*

A high percentage of those surveyed were living in six-member households. The number of people per household ranged from two to ten. An average family consisted of at least two children (under fifteen years of age), while one in four families had a family member over 60 years of age. In many cases, the number of family members was relatively small because many high school children were away at boarding schools or attending schools in Suva at the time of the survey.

At the household level, *Anadara* was considered by Ucunivanua people as the most reliable fishery, the one that most households depended for basic needs throughout the year. In addition to being the prominent source of protein, it also contributed to about 37% of household incomes.

All households (N = 52) surveyed were engaged in harvesting *Anadara* for subsistence and commercial purposes. The number of people per household engaged in a single fishery was much higher for *Anadara* than for any other fishery in Ucunivanua.

Anadara clams are mainly targeted because they are easily harvested and are available throughout the year. *Anadara* was the only fisheries resource that was consistently harvested and sold in the market each week throughout the year. Although other marine resources such as fish, sea cucumbers, seaweed, lobsters and octopus, are sold in addition to *Anadara*, these are only supplementary because they are caught seasonally.

Another advantage of targeting *Anadara* is the fact they are found in areas that are easily accessible to fishers. *Anadara* are mainly collected using hands and feet.

In 1999, *Anadara* catch levels in Ucunivanua were 1308 kg month⁻¹. The higher catch level of 88 *Anadara* hr⁻¹ fisher⁻¹, in contrast to 61 *Anadara* hr⁻¹ fisher⁻¹ in 1998, could be attributed to the increase in cash and food demand, along with the increase in the social obligations of each household. These factors were mainly driven by villagers' commitments to infrastructure-related developments that took place during that period. There were observed temporal increases in the village population during the studied period because of road development. The road upgrade may have also increased the accessibility of fishers to market their catches in urban markets and along road sides.

The demand for cash income to meet the costs of hosting and catering for workers associated with developments, may have accounted for the observed increase in the income levels. Fortnightly incomes from *Anadara* sales increased from FJD 42.28 in 1998, to FJD 57.06 in 1999. Fishing activities tended to be responsive to the household demand, whether it was for cash or for food. Discussions with several prominent fishers revealed that the frequency and intensity of fishing within a week could almost be predicted by social commitments, called *oga*, at the household or village level. The generated income from *Anadara* sales from household surveys in 1999 is presented in Table 2. The majority of households (47%) earned FJD 150–200 in a fortnight from selling *Anadara*.

Table 2. Percentage of households earning income from *Anadara* sales.

Average fortnightly income range (in FJD)	Percentage of households earning income in this range
<50	8%
50–100	10%
100–150	30%
150–200	47%
>200	5%

It was a common practice to identify the amount of money required for the week to meet household needs and additional cash needed for the *oga* before assigning household members to go fishing. Clearly there was pressure on households to earn money to meet its increasing needs. Fishers selling at the market were always under an additional pressure to collect or harvest more. The increase in income from *Anadara* was due to large amounts of *Anadara* collected and sold, and not from changes in selling prices at the markets. Market prices did not change during the study period, but the quantities of *Anadara* collected and sold increased. The proportion of *Anadara* consumed at the household level also increased.

It was evident from the study that the increase in catch levels was dependent on various socio-economic factors such as increase in cash needs of the households and increase in village obligations. The households were also required to contribute cash or food because of increase in development in the village.

The main uses of household income earned from *Anadara* sales are presented in Table 3. Most of the money earned (36%) was used for children's school fees and for buying their stationary. A further 31% of the income earned from selling *Anadara* was used for buying household groceries.

Table 3. Percentage of uses of income earned from *Anadara* sales.

Type of use	Percentage of uses of income
School fees and school stationary	36%
Household needs	31%
Traditional and church obligations	13%
Others (e.g. bus/truck fare, clothes)	20%

Innovative approaches to conservation and management of *Anadara*

A new approach to the conservation and management of inshore fisheries resources included participatory threat assessments by fisherfolk. Participatory threat assessments were carried out in Ucuivanua in 1998 and 1999. Fishers indicated that "overfishing" was a major threat. In particular, *Anadara* fishing, "coral mining" and the "use of fish poison" were identified as major threats. Other dominant activities and issues that were a threat to the productivity and the sustainability of fisheries were increased sedimentation caused by coastal erosion and runoff, and the depletion of mangroves and coastal pollution. The increase in economic demands, increase in the population of the area, indiscriminate burning and logging practices, dumping of domestic and sewage waste into the sea, and changes in diets and social structure were possible explanations.

A series of participatory rural appraisal (PRA) exercises on environmental awareness and biodiversity conservation conducted in Ucuivanua resulted in the development of a community action plan and an integrated resource management plan. The plan addressed specific issues that included banning the use of fish poisons, cutting of mangroves and coral extraction. Goals were also set to stop throwing trash into the sea and improve sanitation in the village by building proper toilets and kitchens for each household. In order to address overfishing, specific areas were set aside as refuges for fish and other marine species.

In this study, more than 90% of respondents were aware that smaller sizes of *Anadara* were being collected compared with the previous year. Women were also collecting fewer *Anadara* while spending more hours looking for them. As a management tool for *Anadara*, the communities established *tabu* areas, a traditional management tool that was usually implemented after the death of a high chief. After the establishment of *tabu* areas, respondents (52%) recommended the establishment of additional *tabu* areas to include other species and adjacent habitats, and to strengthen existing ones. Other recommendations included the imposition of size and catch limits (39%) for vulnerable resources and more awareness (4%). These suggestions were implemented by villagers to ensure the long-term sustainability of the *Anadara* fishery and other coastal resources.

In order to understand the benefits of establishing a *tabu* area, *Anadara* abundances and sizes were monitored in *tabu* areas and harvested areas by village monitoring teams. Monitoring results were discussed with the villagers (through a participatory approach) to help them understand the effective-

ness of *tabu* areas and their use as part of an overall community-based marine management plan (Tawake et al. 2001)

The community-based monitoring approach, applied “scientific concepts” as a tool for measuring the success of the community’s resource management interventions. This was an adaptation from the traditional method of measuring conservation successes. It must be noted that the community-based monitoring approach adopted was specifically sought to help communities routinely measure the effectiveness of *tabu* areas as replenishment zones. The simplified community-oriented nature of the monitoring process used was beneficial in ensuring that the villagers understood the concept of integrating the traditional *tabus* with community-based monitoring adaptive management approaches for the purposes of conserving the *Anadara* fishery.

Summary

Harvesting *Anadara* for sale has provided relatively good returns for the majority of households. One main reasons for villagers’ reliance on this fishery is that the harvesting areas for *Anadara* are easily accessible to fishers during the day. Transportation and fishing equipment (e.g. masks and boats) were either minimal or not required. The usual practice was to walk to the mudflats at low tide and collect *Anadara* by hand.

The reliance on the *Anadara* fishery by the people of Ucuivanua was clearly evident in this study. Fishers needed a source of protein and income. The income supports basic household needs, school fees for students, and village obligations. Village obligations include traditional, church, clothes and bus fares. Our surveys show that more households are engaged in making more food and making a living from the *Anadara* fishery than any other fishery activities.

An innovative approach, using participatory rural appraisals, was used to successfully maintain this fishery as a valuable resource for food and income for Ucuivanua villagers. The community-based approach of developing and implementing a management plan to integrate traditional *tabus* into the fisheries management plan was developed effectively to address villagers’ concerns. The community-based monitoring approach, using scientific concepts of *Anadara* abundances and sizes, was a useful way of helping villagers’ understand the need to conserve this particular resource.

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