

## **Anadara fishing supports urban households in Tarawa, Kiribati and Suva, Fiji**

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### **Introduction**

Women dominate the subsistence fisheries sector throughout the Pacific Islands region (Mathews 1993). In recent years, women's fishing activities have changed from subsistence-oriented to semi-commercially focused fisheries (Vunisea 1997). This shift in fishing practices has been influenced primarily by monetary needs generated by overall modernisation and by corresponding changes in lifestyle and diet.

Women's participation in inshore fisheries activities in Pacific Island states, contribute significantly to food security and small-scale income generation for households. Many Pacific Island countries rely on nearshore marine resources to feed their families. Marine invertebrates, such as shellfish, form a significant portion of women's catch (Keough et al. 1993). Shellfish, especially ark shells (*Anadara* spp.), are an example of a species that is often harvested because it is found in intertidal areas where women fish. Shellfish are a major source of protein for human consumption, as well as a source of income for coastal towns and villages.

Although these bivalves are an important source of dietary protein and income for indigenous people living in the coastal areas of both Kiribati and Fiji, they have received very little attention in the scientific literature and by fisheries managers (Tebano and Paulay 1995). One contributing factor relates to the fact that *Anadara* collectors are mainly women who have gained very little status and recognition among fishing communities (Fay-Sauni 2001). It has been suggested that the general lack of analytical gender-specific information has inhibited development opportunities for women in the fisheries sector (Mitchell 1994).

This study focuses on women's involvement in the ark shell fishery in the urban areas of Kiribati and Fiji. *Anadara* fishing activities and their socio-economic importance at the household level in urban areas were investigated. Because *Anadara* collecting is particularly popular among women in these

two countries, the extent to which women in urban areas support their families through subsistence use and alternative means of earning income, were also examined.

### **Study areas**

#### **Tarawa, Kiribati**

South Tarawa comprises the islets along the southern rim of the atoll, all of which are inter-connected by causeways, allowing easy commuting between communities and employment opportunities in the main urban centres of Bairiki and Betio. Tarawa's very large population is directly or indirectly dependent on coastal marine resources. *Anadara* in this case is one of the more accessible resources for women and households.

The islets on Tarawa are fronted by a largely intertidal reef platform (a few hundred meters wide) on the ocean side, and a wide sand flat on the lagoonal side. Most of the western rim of the atoll, which is below sea level, consists of a wide, submerged barrier reef lying at a depth of a few meters, interrupted by a single deeper passage near its southern end.

The study area in South Tarawa ranged from Teoraereke to Bikenibeu (Fig. 1). On Tarawa, *Anadara* is most commonly found in seagrass beds on lagoonward margins of sand flats along the villages from Ambo to Bikenibeu.

#### **Suva Peninsula, Fiji**

Suva Peninsula lies on the southern tip of Viti Levu island in Fiji and covers approximately 15 km<sup>2</sup> (Fig. 2). The intertidal zone around Suva Peninsula supports a wide range of finfish and invertebrate subsistence fisheries (Quinn and Davis 1997). The intertidal area consists primarily of soft sediment mudflats. The sand flats of this region support a subsistence invertebrate fishery, an important source of fresh marine food for many low-income families around metropolitan Suva (Quinn and Davis 1997).

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Figure 1. Tarawa, Kiribati.

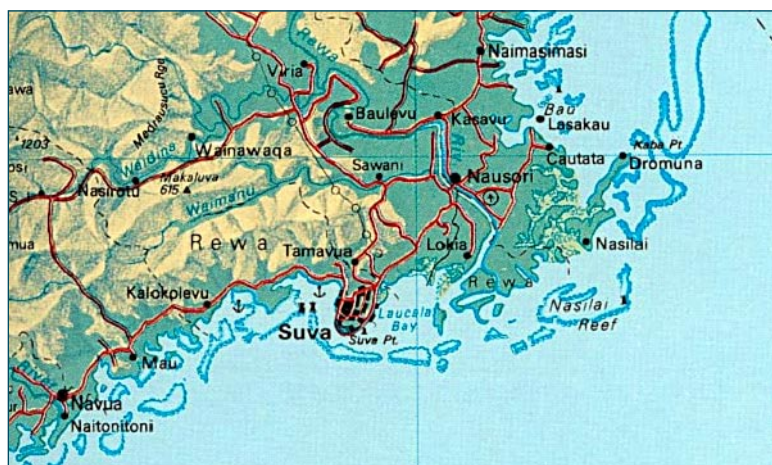


Figure 2. Suva Peninsula and surrounding areas and reefs  
(Source: www.fiji.gov.fj).

Surveys were conducted within the Suva Peninsula area from the Pony Club to Nasese areas. The substratum sediment ranged from coarse sand and rubble along the shoreline, to fine sand and silt mainly towards the centre. Although the seagrass *Halodule uninervis* was present throughout the study area, a large dense bed was observed within the area. The seagrasses *Halophila ovalis* and *Springodium isoetifolium* were also observed.

## Methods

### Questionnaire survey

A questionnaire survey was designed to extract socioeconomic information from individual house-

holds of women residing in the urban communities studied. Such information is essential in assessing the impact of the *Anadara* fishery on the lives of these women. The questionnaire surveys were undertaken only in urban areas as described above for the two countries, because the *Anadara* fishery is under significant fishing pressure in these areas (Davis et al. 1998). Women were interviewed about their household income and expenditures, fishing activities, traditional and biological knowledge of *Anadara* species, and their level of participation in conservation and resource management.

In total, 97 women were questioned about their involvement in the *Anadara* fishery in South Tarawa in Kiribati. At Suva Peninsula, in Fiji,

84 women were interviewed. The questionnaire included questions about household size and composition, occupation of each family member, other employment activities, level of income from fisheries activities, fishing methods used by each household, and individual experiences with *Anadara* such as fishing areas, methods, catch composition and effort.

**Creel surveys**

Creel surveys were undertaken to determine the amount of *Anadara* collected by women (measured in kilograms per hour). Catch was measured by weighing women’s *Anadara* catches using a handheld spring balance, while fishing effort was measured by the number of hours women fished.

Women were interviewed when they returned from fishing. Fishing time was estimated using three main categories: 2 hours or less, 4 hours, and 6 hours.

**Results**

**Demographics and household details**

The majority of fishers engaged in *Anadara* fishing in South Tarawa and Suva were in the 30–39 year age group.

This study highlighted how young women (less than 20 years of age) in South Tarawa are usually left at home to look after toddlers, while other women in the household go out fishing for *Anadara*.

In contrast, women in Suva were usually more active in *Anadara* fishing. The study further revealed that a relatively high percentage of respondents (48% in South Tarawa and 64% in Suva) stated that at least one woman in the household was engaged in harvesting *Anadara* (Fig. 4). Up to four women per household in Suva compared with five in South Tarawa were involved in *Anadara* fishing (Fig. 4).

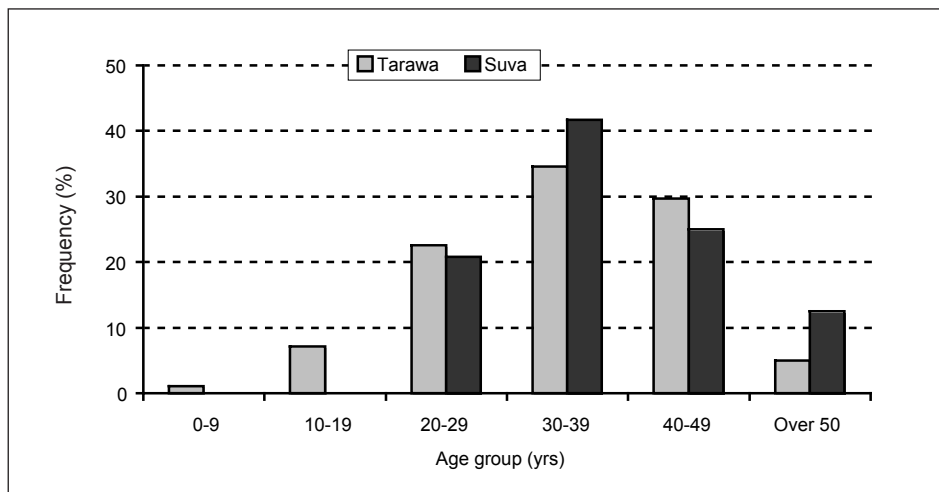


Figure 3. Age composition of women engaged in *Anadara* fishing activities.

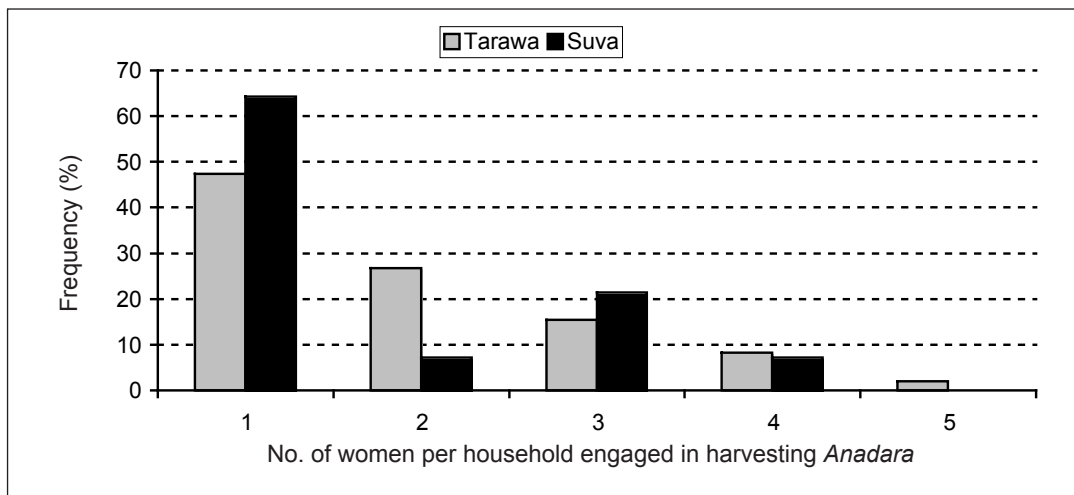


Figure 4. Frequency of women per household engaged in harvesting *Anadara*.

Over 90 respondents were unemployed compared with 57% in Suva. The high unemployment in South Tarawa explains the greater interest and involvement in *Anadara* collecting. Nonetheless, women who lived in households with members who had some form of paid employment were still engaged in harvesting shellfish to supplement earnings or to help reduce spending on other protein sources. By comparison, Suva had a relatively higher and wider range in average fortnightly earnings compared with South Tarawa. There was a wider variety of job opportunities (e.g. garment factories and other manufacturing industries) available to women in Suva, with some respondents receiving up to AUD 300 per fortnight, in contrast to earnings between AUD 36 and AUD 200 in South Tarawa.

Many households were totally reliant on the *Anadara* fishery to sustain a living in South Tarawa. This was for both subsistence and economic needs. About 62% of respondents stated that no one in the household was employed in Kiribati, as compared with 36% in Suva. Nine respondents from South Tarawa further stated that their households had no other source of income. Other respondents had other ways of earning money, including the production and sale of handicrafts, and sales from shellfish (e.g. *Anadara*), doughnuts, bread, buns, *tibuta* (a traditional Kiribati women's blouse), local candies and other items.

Women in both countries typically travel to fishing grounds either on foot or by boat (which usually belong to men). In South Tarawa, fishers walk to fishing grounds or travel by bus from Betio. In Suva, fisherwomen either walk to the fishing ground or catch a bus or truck, and then walk the rest of the way. Thus, there is very little use of, or reliance on, sophisticated forms of transport.

### **Target areas and fishing methods**

Although *Anadara* collection is referred to as "gleaning", women are skilled at identifying where the *Anadara* are partially buried, and also have special ways of using their feet to find the clams in the sand or mud before picking them up with their hands. Also, women search for signs of the clams' siphons at the water's surface on an incoming tide. Women visually spot the half-covered *Anadara* shell gape in clear water at low tide. Thus, women are usually observed wading out from the beach towards the seagrass beds at high tide, feeling with their toes for shells in the muddy sand. They fish as far out as they can stand with their heads above the water. As the tide recedes, women use their fingers to search for the clams. This practice was particularly common in South Tarawa. In Fiji, however, women predominantly go out when the tide was at its lowest.

In South Tarawa, at Teoraereke village, a recently re-settled area, more people were observed fishing for *Anadara*. This could be explained by the area's high unemployment rate and the collection of *Anadara* for food and income.

This study's survey results from Suva and South Tarawa show that the preferred fishing areas for *Anadara* were seagrass beds (*Halodule* sp.) and areas with soft muddy substrates. It was also common for fishers to search for *Anadara* along the sand and mudflats on their way to the seagrass beds and when they returned home.

*Anadara* harvesting is a frequent activity, with women collecting several times a week during low tides. In South Tarawa, there was a distinct difference between the frequency of harvesting for home consumption and the harvesting for sale: two to three times a week on average (65%) for home consumption only, versus daily (83.5%) for both sale and home consumption. Thus, with the exception of Sundays, collection for both sale and consumption combined was an almost daily activity.

In Suva, about 50% of the women fished at least once a week and this was on Saturdays. Fishing more frequently was difficult because of paid employment and other family commitments. The number of women engaged in fishing depended mainly on whether the *Anadara* were intended for home consumption, sale, family or community functions or sending to families abroad as in Tarawa. Thus, the collection of *Anadara* was an almost daily activity in both locations and this pattern intensified when fishing for commercial purposes.

### **Anadara sales**

This study showed more pronounced selling activities, and therefore greater dependence on *Anadara*, in Kiribati than in Fiji. In South Tarawa, *Anadara* was commonly sold either fresh in large 10-kg bags along the roadsides, or cooked. About 56% of South Tarawa respondents were engaged in selling *Anadara*, in contrast to 7% from Suva. About 85% of South Tarawa respondents sold *Anadara* six times a week. This was mainly at Bairiki market where cooked *Anadara* meat was sold in plastic bags for one dollar and served with breadfruit or coconut. In Suva, respondents selling *Anadara* clams from the study site was rare, and this was only if there was excess catch. On average, fishers in Suva sold *Anadara* at least once per fortnight.

About 35% of respondents earned about AUD 150 each per fortnight from selling *Anadara* in South Tarawa. The women's average fortnight earnings were approximately AUD 167. Most of this income went to household necessities, school fees, clothing



and bus fare. Household income by women was predominantly earned from fishing activities (44%). Women are increasingly involved in semi-commercial activities such as the selling of doughnuts, handicrafts, rolled tobacco, boiled toddy and other items, and income from these sales were used to supplement the family income. An estimated 61% of South Tarawa women were solely responsible for earning household income (Table 1).

In the case of Suva Peninsula, only 7% of respondents acknowledged the contribution of *Anadara* sales to their household income. Half of these women stated that *Anadara* sales were their sole source of family income. The remaining 93% of respondents collected solely for home consumption. Those who sold their catch used the money to purchase household necessities (especially other food items), and pay for transport costs.

*Anadara* were sold for AUD 2.00 a heap (2–2.5 kg) at the Suva market or to neighbours. The average fortnightly earning from this was approximately AUD 40. Other marine species that women often sold with *Anadara* at the market included *Dolabella* (seahare), crabs and prawns.

#### **Anadara catch levels and creel catch analyses**

An estimated 72% of Suva fisherwomen stated that *Anadara* constituted 25–50% of their catch, compared with 59% in that category in South Tarawa. Also, 57% of Suva respondents stated that their average catch was 2.5 kg, whereas 43% stated that they caught about 5 kg per day-trip. However, for South Tarawa, 78% stated that their average catch was 10 kg, whereas 22% reported catching 15–45 kg per day-trip. This could be indicative of the differences in reliance on *Anadara* as food and an income source, and could signify the abundance of *Anadara* in the two locations.

When women glean on the flats, *Anadara* is not the only species they target. The most common mol-

luscs and crustaceans collected in South Tarawa are: *anadara* (ark shell, *Anadara* sp.); *nouoo* (lipped strombus, *Strombus luhuanus*), *katura* (surf clam, *Atactodea striata*), *koum'ara* (shellfish, *Gafrarium pectinatum*), *koikoi* (shellfish, *Asaphis violascens*), *wiiaau* (snail, *Cymatium muricinum*), and *te ibo* (a seaworm, *Sipunculus indicus*) and *nimataanin* (reef shell). All of these were primarily found along the mudflats and seagrass beds. For Suva, the other species that were collected together with *Anadara* in the area included: *kaidawa* (hard shell clam, *Periglypta puerpera*), *kuku* (mangrove mussel, *Modiolus agripetus*), *drevoua* (moon snail, *Polinices flemingianus*) and *veata* (green sea hare, *Dolabella auricularia*).

Suva fisherwomen usually collected between 1 and 2 kg hr<sup>-1</sup> of fishing, with 2 kg hr<sup>-1</sup> being the most common (48%). In South Tarawa, CPUE ranged from 1–8 kg hr<sup>-1</sup> (Fig. 5). Women fishing along the flats of Eita village achieved the highest CPUE (8 kg hr<sup>-1</sup>). These women collected approximately three bags (10 kg per bag) per fishing trip and most women sold their catch 6 days a week. Again, the differences could be an indication of the degree of abundances of the species.

The average CPUE in South Tarawa was 3.1 kg hr<sup>-1</sup> (Table 2) and the mean catch per fisherwoman was approximately 1087 kg yr<sup>-1</sup>. Calculations using a mean of 200–400 harvesters per day (Paulay 1995) showed that between 217 and 435 tonnes of *Anadara* were collected per year from South Tarawa's sand flats. Creel survey data from this study also showed that on average, 1 kg of *Anadara* equalled approximately 42 *Anadara* in South Tarawa.

#### **Discussion**

As evident from this study, the *Anadara* fishery is important in many Pacific Island countries. Although women's involvement in this fishery has been mainly at the household level, it has recently become more commercialised with catches con-

**Table 1.** Women's contribution to household income in South Tarawa (N = 97) and Suva (N = 84)

Household income	Rank (%)	
	South Tarawa	Suva
Solely earned by women	61	-
Predominantly earned by women	20	17
Partly earned by women	13	43
Least earned by women	6	40

tributing significantly to household incomes, such as in Kiribati.

Women fishing for *Anadara* were predominantly between the ages of 30 and 39 years, although some women over 50 years of age at Suva Peninsula were frequently seen fishing. These would be mostly married women assisting with household food and income. In South Tarawa, women younger than 50 years of age were predominantly engaged in *Anadara* fishing, although older women were perceived to be more efficient and skilful in collecting *Anadara* because they knew exactly where and when to go. These women have extensive local knowledge relating to the tide, moon phase and cloud cover that are best for certain types of fishing. For many wom-

en, these skills are handed down by their elders and they only pass it on to their descendants. In Fiji, seasonality affects the fishing patterns of some species such as mangrove crabs and *Anadara*, which are targeted on a rotational basis.

More women per household in South Tarawa are engaged in the *Anadara* fishery than in Suva. This may be due to the high unemployment level, the large number of people per household, and the high abundance of *Anadara* in South Tarawa. In South Tarawa, many households rely totally on the *Anadara* fishery to sustain their living. In other households where there was little income, families collected *Anadara* for household protein and purchased other necessities with whatever money they had.

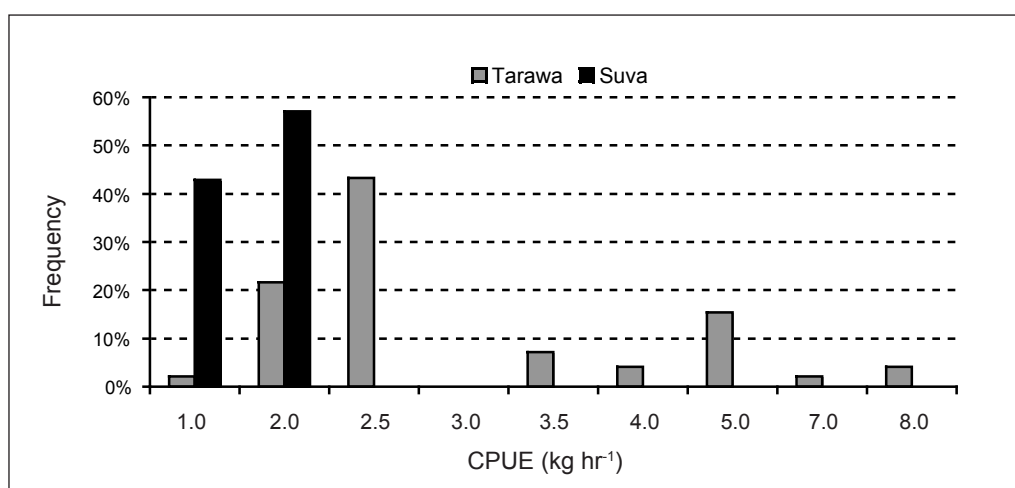


Figure 5. Percentage distribution of catch per unit of effort (CPUE) in kg h<sup>-1</sup> for women in South Tarawa and Suva.

Table 2. Summary of *Anadara* catch calculations for both South Tarawa and Suva

Details	South Tarawa	Suva
Average CPUE (kg hr <sup>-1</sup> )	3.1	0.6
Average catch per fisherwoman per year	1087	118
Average number of harvesters per day	200–435	5–9
Number of <i>Anadara</i> per kilogram	42	43
Total number of <i>Anadara</i> collected each year	9,331,000–18,705,000	25,327–45,666
Total area covered by creel survey (m <sup>2</sup> )	10,000,000	900,000
Relative density of <i>Anadara</i> in the area (ind. m <sup>-2</sup> )	2.9	2.9
Approximate no. of <i>Anadara</i> in area	29,000,000	2,610,000
Percentage caught per year (%)	32–64.5	1–2

Another important factor that explains how these households are able to sustain a living is the cultural practice of *te kaonoono*. This is a traditional gifting system whereby people give food to family, friends and neighbours and in return receive fish, taro, breadfruit and household items (Vunisea 1996). Usually friends and relatives who are well off give money and basic imported food items such as rice, flour and sugar to their relatives. In unusual circumstances where families are facing great difficulties, they go and ask for money and food from neighbours, friends or relatives. The use of the *Anadara* resource for consumption, sale and trading for other basic goods appears to be prominent among poor families in South Tarawa. The continuing intense harvest of *Anadara* by the local population without any proper monitoring or management may have adverse effects on the sustainability of the *Anadara* fishery.

In many urban Pacific Island communities, one person working is usually economically insufficient to support an entire household, thus women involved in small-scale income generation, such as the *Anadara* fishery, play a crucial role in supporting households.

The predominant *Anadara* consumption pattern in both countries is twice weekly with some households consuming *Anadara* every day. This is particularly true for larger households in South Tarawa. About 77% of the urban households in Kiribati did not have canoes to access the lagoons for other types of fishing, thus shellfish consumption was high compared to the outer islands.

Methods and gear employed by fishers are still very traditional, with minimal impact on surrounding habitats. In Kiribati and Fiji, *Anadara* fishing is strictly confined to the use of bare hands, with no gear used. However, overturning stones and disturbance to seagrass habitats are common when searching for *Anadara* and can cause potential damage to the substrate and other fauna. Several factors may explain the different level of women's participation in the *Anadara* fishery. In terms of fishing effort, women in Suva fished at least once per week (50%). The involvement of women in fishing for other target marine organisms (e.g. mangrove lobsters and crabs) may explain the pattern of *Anadara* fishing in Suva. Likewise, work commitments (at home or through part-time paid jobs) influence fishing effort.

In comparison, fishing in South Tarawa takes place six times a week (46.4%), Sunday being the exception. The reason for the difference in participation is mainly due to opportunities available for women in Kiribati. Unlike Fiji, there are few employment opportunities so women who do not have paid jobs engage in fishing for *Anadara*.

Selling *Anadara* was common in Kiribati. This study found that 56% of respondents in South Tarawa sold *Anadara*, compared with 7% in Suva. About 85% of respondents in South Tarawa sold *Anadara* on a weekly basis, mainly at the Bairiki market. In Suva, it was harvested mainly for home consumption, whereas in South Tarawa, it was for both home consumption and commercial purposes.

In South Tarawa, there is a thriving domestic market for *Anadara*, which includes the selling of cooked *Anadara* at the Bairiki market, especially on government fortnightly paydays. The findings of this study show that 35% of South Tarawa respondents earn AUD 150 per person every fortnight from *Anadara* sales. This amount is equivalent to the average wage of household members in paid jobs. Basic household necessities, school fees and other related items were reported as the most common uses of the income. Sale data for *Anadara* in Fiji is quite different from Kiribati. Fishers in Suva only earn about AUD 60 per fortnight.

Fishers' catches show no significant differences when compared with previous findings. The average CPUE of  $3.1 \pm 0.179$  kg hr<sup>-1</sup> (approximately 1048 kg yr<sup>-1</sup>) for fishers in South Tarawa was within the range estimated by Paulay (1995), who found a CPUE of  $8 \pm 6$  kg hr<sup>-1</sup>. The creel surveys found a CPUE of  $0.6 \pm 0.08$  kg hr<sup>-1</sup>, which is equivalent to 118 kg yr<sup>-1</sup>. Although this is lower than those estimated by Quinn and Davis (1997) who stated it to be 1.1 kg hr<sup>-1</sup>, these figures are still very similar because the variability was not given. This difference in CPUE results can be attributed to methods employed in the creel surveys, weather, time of the year surveying took place, and the number of people interviewed.

In summary, *Anadara* like other invertebrates collected by women, are usually not seen as fishing activities and so are not enumerated or included in official statistics. This study, however, highlights the vital role such fisheries play in maintaining food security and household income in urban areas in Kiribati and Fiji.

### Acknowledgements

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