

Appendix 1: Country Specific Re-Estimates of the Fishing Contribution to GDP

Given the complexity of the issues to be addressed and the large difference in the accuracy of the estimates made in the Pacific Island countries, it was considered essential to re-estimate the fishing contribution to gross domestic product (GDP) for each country. It was believed that, at the very least, the re-estimates would provide useful comparators for the compilers of national accounts. In addition, it was anticipated that the review of the different methods and approaches used in each country would provide useful insights into the effectiveness of alternative approaches to the task.

In some of the countries, the methods used to calculate the fisheries component of GDP were well documented. In others, this information was obtained verbally. It is likely that at least some of the verbal information were inaccurate for various reasons, including the provider being unfamiliar with the subject. This should be taken into account when considering the comments on any weakness in the methodology.

Cook Islands

The Nominal Contribution of Fishing to GDP

The consultants estimate that the fishing contribution to Cook Islands GDP in 2000 was about NZ\$17.3 million, slightly less than the NZ\$19.4 million reported in the official figures.

It is noted that the official figures were radically revised in 2000 with the reported contribution of fishing to GDP increasing from NZ\$4.4 million in 1999 to NZ\$19.4 million. This increase was due to an improvement in the measurement of exports of black pearls, part of which is believed to be unrecorded.

Table A1.1: Official GDP and Fishing Contribution of Cook Islands, 1996–2000
(NZ\$)

Item	1996	1997	1998	1999	2000
GDP (current market prices)	149,069,000	144,239,000	146,294,000	155,650,000	171,599,000
Commercial Fishing					14,919,000
Subsistence Fishing					4,491,000
Fishing Contribution to GDP					
By Value	1,776,000	1,453,000	3,909,000	4,415,000	19,410,000
By Share (%)	1.2	1.0	2.7	2.8	11.3

GDP = gross domestic product; NZ\$ = New Zealand dollar.

Sources: Statistics Office (2000), Statistics Office unpublished data, Updates by Statistics Office (pers. com., August 2001).

Background

The Government's Statistics Office prepares the Cook Islands national accounts. The most recently published tables include GDP estimates from 1982 to 2000. The published accounts show both current and real GDP estimates for each of the major sectors and industry groups in the economy. For publication purposes, the fishing industry is grouped with Agriculture.

The Statistics Office uses a production approach to calculate the contribution of small- and large-scale commercial fishing to GDP. The Office relies upon a combination of export records, fisheries surveys and market prices to determine the gross output of these sub-sectors. Production by the subsistence sector is imputed from data collected in the 1998 Household Income and Expenditure Survey (HIES) that measured household and per capita consumption of fish.

Methods used to Calculate Contribution to GDP

To calculate the contribution of fishing to GDP, the Statistics Office divided the sector into two categories, each with subcategories.

- ***Incorporated Fishing Enterprises.*** This category covers all full-scale commercial operations including pearl farming, live fish exports (aquarium fish), and tuna and other fishing. The value-added output ratios for each of these subcategories are (i) pearl, 80%; (ii) pearl shell, 90%; (iii) live fish, 80%; and (iv) tuna and other fish, 60%. The value-added ratios appear reasonable given the nature of the different activities.
- ***Subsistence Fishing.*** The contribution of subsistence fishing includes fishing for home consumption and for informal sales. The estimated contribution from home consumption is based upon the 1998 HIES. The values for the years since 1998 are extrapolated using population and a composite index to adjust for prices changes and periods of intensive subsistence activity. The estimate of the contribution of informal sales assumes that such sales are a proportion of home consumption.

Comments on the GDP Calculation

The methods used by the Statistics Office are appropriate. However, there are questions about the accuracy of some of the data.

The substantial increase in the fishing contribution to GDP between 1999 and 2000 captured most of the value added of the sector. However, the Manihiki disease survey carried out by the Ministry of Marine Resources in December 2000 on Manihiki and Penrhyn atolls indicated that the production may be even higher than previously thought (Ponia pers. com.). In particular, the published national accounts may not have taken into account domestic sales of pearls to tourists. The survey indicates that the gross output in 2000 was NZ\$20.4 million, NZ\$2.0 million more than the estimate used to compile the GDP estimate reported in the 2000 national accounts. In addition, the contribution of live fish (NZ\$250,000), tuna and other fish (NZ\$200,000, principally trochus) as estimated by the Ministry of Marine Resources have not been included in the calculation (Bertram pers. com.).

One of the difficulties facing the compilers of national accounts is the choice of data series. In the case of the Cook Islands, the Statistics Office has chosen to use the official trade figures rather than the estimates prepared by the Ministry of Marine Resources that have been used in this report. Officials from the Statistics Office indicated that there were several sources of data for pearl production including one from the Pearl Federation. The information in each of these sets of data differs. In the circumstances, the Statistics Office elected to use the official trade figures because they are compiled regularly and are likely to be ongoing.

Imputing production from the data reported in an HIES is a valid method to calculate the contribution of subsistence fishing to GDP, provided there is no better source of data available. The method relies upon the HIES being an accurate reflection of contemporary consumption of, and/or expenditure on, fish. The older the HIES the less likely it is to be relevant. The assumption that informal sales are a proportion of household consumption should also be reconsidered.

In the Cook Islands, there are other estimates of subsistence and small-scale commercial fishing production. Dalzell et al. (1996) used data sources from the late 1980s and early 1990s to estimate subsistence fishing and commercial coastal fishing production. They concluded that the amount and value of production were, respectively, 858 mt (US\$3,047,683) and 124 mt (US\$314,761). According to the Ministry of Marine Resources, in 2000, small-scale commercial fishing (informal sales) produced 80 mt valued at NZ\$650,000 and

subsistence production amounted to 795 mt worth NZ\$2,200,000 (Bertram pers. com.). The Statistics Office should examine these data and determine whether or not they support the information gathered in the HIES.

Revised Estimates of GDP

Incorporated fishing enterprises:

Pearls and pearl shell:	NZ\$18,400,000	*	0.80	=	NZ\$14,720,000
Live fish:	NZ\$252,000	*	0.80	=	NZ\$201,600
Others (principally trochus):	NZ\$200,000	*	0.80	=	NZ\$160,000

Source of data: Ministry of Marine Resources (Bertram and Ponia, pers. com.). Production and price information as per Appendix 2. The value-added ratio of 0.80 is the same as that used by the Statistics Office.

Small-scale commercial fishing:

$$80 \text{ mt} * \text{NZ\$8,125} * 0.60 = \text{NZ\$390,000}$$

Source of data: Ministry of Marine Resources (Bertram and Ponia, pers. com.). The value-added ratio of 0.60 assumes that all the small-scale fisheries use motorized boats when fishing.

Subsistence fisheries:

$$795 \text{ mt} * \text{NZ\$2,770} * 0.85 = \text{NZ\$1,871,828}$$

Source of data: Production as per Appendix 2. The value-added ratio of 0.85 assumes that the subsistence catch is taken by a mix of gleaning, diving, and the use of motorized boats.

This can be summarized and compared to the official estimate:

Table A1.2: Official vs. Re-estimates of GDP and Fishing Contribution of Cook Islands, 2000 (NZ\$)

Item	Official GDP Estimates	Consultants Revised GDP Estimates
GDP (current market prices)	171,599,000	175,604,000
Fishing Contribution to GDP	19,410,000	17,343,428

GDP = gross domestic product; NZ\$ = New Zealand dollar.
Sources: Statistics Office (pers. com. 2001); Consultants' estimates.

Federated States of Micronesia

The Nominal Contribution of Fishing to GDP

The consultants were able to obtain two separate estimates of GDP for the Federated States of Micronesia (FSM). In 1998, the National Statistics Office (NSO) published the following estimates for 1996.

Table A1.3: Official GDP and Fishing Contribution of FSM, 1996

Item	By Value (US\$)	By Share (%)
GDP (current market prices)	181,600,000	100.0
Agriculture, Hunting, Forestry (includes Subsistence Fishing)	30,300,000	16.7
Fishing	4,400,000	2.4

FSM = Federated States of Micronesia; GDP = gross domestic product;
US\$ = United States dollar.
Source: National Statistics Office (1998).

The FSM Economic Management and Policy Advisory Team (EMPAT) has prepared a Social Accounting Matrix (SAM) from 1998 data. The SAM includes data on the contribution of fishing and fisheries to GDP. These data were used to construct Table A1.4.

The consultants estimate that the fishing contribution to GDP in 1998 was US\$21.95 million. The consultants' estimate is about double the EMPAT estimate. The principal reason for the difference is the inclusion of subsistence fishing in the consultants' estimate of fishing contribution to GDP.

Background

The 1998 publication, "Gross Domestic Product—Federated States of Micronesia," arose out of an Asian Development Bank (ADB) funded project to strengthen the NSO's analytical capacity and improve the quality of the data produced by the office. According to NSO (1998), "prior to that year [1998] FSM had been using widely varying estimates of the country's GDP with a very weak

**Table A1.4: Official GDP and Fishing/Fisheries
Contribution of FSM, 1998
(US\$)**

Item	1998
GDP (current market prices)	229,869,864
Fishing Contribution to GDP	
Reef Fish Artisanal	3,136,955
Tuna Fishing	7,669,315
By Value	10,806,270
By Share (%)	4.7
Fisheries Contribution to GDP	
Total Fishing	10,806,270
Processing & Services	2,605,147
By Value	13,411,417
By Share (%)	5.8

FSM = Federated States of Micronesia; GDP = gross domestic product; US\$ = United States dollar.
Source: Economic Management and Policy Advisory Team (EMPAT) unpublished data (2001).

empirical basis: these estimates relied mainly on limited anecdotal data or strongly held convictions.”

The EMPAT’s work on the SAM has been on going for several years. It is not known whether the SAM is still a work-in-progress or had been finalized at the time the data were extracted. In the circumstances, the following should be treated as commentary on the issues that should be addressed rather than a critique of the SAM.

Methods used to Calculate Contribution to GDP

In 1996, 675 establishments in the FSM were surveyed. The results included information on employment, wages, and value added, which were used to compile the nonsubsistence component of the GDP. With regard to the subsistence component of the economy, NSO (1998) states:

“The value of agricultural and fisheries output produced and consumed by the same household was estimated for each of the four FSM states as follows:

- The population in 1996 was estimated;
- The level of food imports was estimated for 1996 (Kosrae has the only data, the value was estimated for the other states);

- The daily per capita value of food imports was calculated and converted to daily per capita number of calories (2,258 calories per dollar of imported food);
- Assuming the per capita calories consumed in FSM is 2,400, this equals imported calories (given above) plus calories which are obtained from local foods;
- By assuming that the calories per dollar of local food is 1,577, a total dollar value of local food consumed per capita can be obtained."

The consultants were advised that the SAM prepared by EMPAT used 1998 GDP data from the public enterprise accounts for large-scale fishing and processing. Data from a household survey were used to measure the contribution of the small-scale commercial fishing. EMPAT staff has confirmed that the SAM only includes estimates for the cash part of the economy and does not include subsistence.

Other studies of the fishing or fisheries industry have been undertaken, including (i) Petersen (2001) who cites a variety of sources and indicates that the "fishing industry" was responsible for 15.5% of the FSM GDP in 1990, and (ii) World Bank (1995) which stated that, in 1996, "fisheries" was responsible for 6.0% of the FSM GDP.

Given the history of poor quality data and the limited resources that have been committed to improving the quality of the data, it is difficult to give much credibility to the available estimates of fishing contribution to GDP.

Comments on the GDP Calculation

The World Bank's 1996 estimate:

- The documentation supporting the NSO estimate of GDP provides a concise outline of the approach used to measure GDP, but it does not provide details of the actual calculations. The description of the approach includes the general comment that "the production approach was used to measure the value added of individual establishments and a cost approach was used to compute the value added of government services and non-profit institutions."

- The calculation of the value added by subsistence activities in the NSO publication seems to give an estimate of the value of locally-produced food, not the purported “value of agricultural and fisheries output produced and consumed by the same household.” If this is an accurate reflection of the calculation, the “Agriculture, Hunting, Forestry (includes *Subsistence Fishing* [emphasis added])” item in Table A1. 3 would be more correctly described as “Agriculture, Hunting, Forestry (includes agriculture/fishing for *local consumption* [emphasis added]).”

The 1998 SAM estimate:

- The estimate does not include the contribution made by subsistence fishing, nor that made by the large-scale tuna purse seiner based in Chuuk.
- The small-scale commercial fishing contribution is calculated using the income approach. It is often quite difficult to obtain reliable estimates of income from the multitude of fishers in this category.

Revised Estimates of GDP

Offshore fishing:

$$2,500 \text{ mt} * \text{US\$}5,000 * 0.50 = \text{US\$}6,250,000$$

Source of data: Production and price information as per Appendix 2. Includes foreign-owned offshore fishing where the operation is based in FSM. The production is the estimated total catch of locally-based long-line vessels. The price used is the free-on-board (FOB) prices received for sales to Japan.

Small-scale commercial fishing:

$$5,000 \text{ mt} * \text{US\$}2,900 * 0.60 = \text{US\$}8,700,000$$

Source of data: Production and price information as per Appendix 2. The production estimate is based on information from fisheries literature, the 1998 HIES, and other published sources. It is estimated that total coastal fisheries production is 10,000 mt, about half of which is taken by small-scale commercial fishing. The price is derived from data published in the 1998 HIES. Value-added ratio assumes that nearly all the catch is taken using motorized boats.

Subsistence fishing:

$$5,000 \text{ mt} * \text{US\$}2,000 * 0.70 = \text{US\$}7,000,000$$

Source of data: Production as per Appendix 2. The production is estimated to be 50% of the total coastal fisheries production of 10,000 mt. The price used is the estimated “farm gate” price, which is assumed to be the commercial price of US\$2.90/kg less 30% for transport and marketing. Value-added ratio assumes that much of the catch is taken using motorized boats.

This can be summarized and compared to the official estimate:

Table A1.5: Official vs. Re-estimates of GDP and Fishing Contribution of FSM, 1998 (US\$)

Item	EMPAT GDP Estimates	Consultants' Revised GDP Estimates
GDP (current market prices)	229,869,864	229,881,008
Fishing Contribution to GDP	10,806,270	21,950,000

EMPAT = Economic Management and Policy Advisory Team; FSM = Federated States of Micronesia; GDP = gross domestic product; US\$ = United States dollar.
Sources: EMPAT unpublished data; Consultants' estimates.

Fiji Islands

The Nominal Contribution of Fishing to GDP

Table A1.6: Official GDP and Fishing Contribution of Fiji Islands, 1998–2001 (F\$)

Item	1998	1999 <i>provisional</i>	2000 <i>estimated</i>	2001 <i>forecast</i>
Real GDP (1989 prices) ^a	1,906,049,000	2,088,844,000	1,894,192,000	1,916,299,000
Fishing Contribution to Real GDP				
Market Production	26,209,000	36,503,000	40,445,000	44,085,000
Non-market Production	—	—	—	—
Total Fishing (without Subsistence Fishing)				
By Value	26,209,000	36,503,000	40,445,000	44,085,000
By Share (%)	1.4	1.7	2.1	2.3

F\$ = Fiji dollar; GDP = gross domestic product.

^a The published estimates of GDP in current prices do not show the contribution of fishing.
Source: Bureau of Statistics, unpublished Agriculture GDP worksheets.

The consultants estimate that fishing contributed F\$84.6 million to GDP in 1999. In constant 1989 prices, the contribution in 1999 was around F\$48.9 million, which is about 34.0% higher than the official estimate.

Background

The Bureau of Statistics calculates the GDP estimates for the Fiji Islands. The various components of fisheries are not reported separately in the published estimates of GDP in current prices. Subsistence fishing is included in the overall "Subsistence" sector. Commercial fishing, including small-scale and offshore fishing, is included in the "Agriculture, Forestry and Fishing" sector. Fish handling, processing, marketing, and transport activities are spread through the "Food Manufacturing," "Wholesale and Retail," and "Transport" sectors.

Methods used to Calculate Contribution to GDP

The Bureau of Statistics has a three-page explanation of the method it used to calculate the contribution of the fishing industry to GDP. According to that document, "the fishing industry is divided into four sectors:"

- *Industrial fishery*—operates on a large scale and is export oriented.
- *Artisanal fishery*—comprises small-scale commercial production.
- *Subsistence fishery*—the production-cum-consumption sector.
- *Aquaculture*—largely experimental.

In practice, the calculation of the fishing contribution is limited to the *industrial fishery* and the *artisanal fishery*. The contribution of the *subsistence fishery* is included as part of the overall contribution of subsistence. Currently, the contribution of *aquaculture* is trivial, and it is ignored in the calculations.

The contributions of industrial and artisanal fishing have been estimated using a production approach. In the case of the industrial fishing, the gross output and intermediate cost data were obtained from a survey of the large-scale fishing companies. The contribution of artisanal fishing was estimated from information obtained in a survey of commercial fishers and data from loan applications made to the Fiji Development Bank.

The contribution of subsistence fishing to GDP is included in the Bureau's estimate of the contribution of overall subsistence production. The calculation is based upon data collected in the 1991 household expenditure survey. The survey collected aggregate data and it is not possible to single out the fishing component.

Officials at the Bureau of Statistics advised that it was not currently possible to separate the contribution of fish processing from the "Manufacturing – Other Food Industries" category.

Comments on the GDP Calculation

At least in theory, the methods used by the Bureau of Statistics to measure the contributions of industrial fishery and artisanal fishery to GDP should produce reasonable estimates of the sectors' contribution to GDP. The results, however, suggest that they are significantly undervaluing the contributions.

One important issue is the valuation of gross output. The completeness of the fish export data is suspect. The primary source for export data is the Customs records, which understate the export quantity and value. Discussions with Customs officials indicate that, since there are no revenue or enforcement issues associated with exports, they have little incentive to ensure the records are accurate. In particular, the prices quoted on export invoices understate the price that is eventually received. Exporters are required to indicate the price received for their product on the export documentation prior to shipping. Since the eventual sale price is unknown at the time of export, the figures recorded are not correct. Not surprisingly, most exporters usually record a conservative price on their export documentation. This understated price is the price that is recorded in the statistical database. Needless to say, the combination of a low price and inaccurate quantities results in a markedly lower gross output value and, hence, an underestimate of the subsector's contribution to GDP.

The ratios of intermediate consumption to gross output being used by the Bureau were obtained from surveys of the large-scale fishing enterprises and from field interviews of medium- and small-scale fishers. The large-scale fishing enterprises are involved in the offshore fishery. The value-added ratio derived for this sector is 53.5%. This ratio appears to be a little high when compared to the information in reports on the fishery in the Fiji Islands and elsewhere. Both

medium-scale and small-scale fishing identified in the report supply the local market and collect marine products for processing and export. Bureau officials advised that the two activities were differentiated by the nature of their customer base and the type of associated facilities involved in the activity. Medium-scale fishing is a full-time activity that typically supplied fresh fish to established retail outlets and usually maintained cold storage facilities. The value-added ratio for this activity was assessed to be 54.7%. This ratio is slightly lower than that indicated in other comparative data. The small-scale fishing activity included occasional fishing and those fishers that typically sold their catch at the local market or on the side of the road. Normally, this activity does not have associated cold storage facilities. The survey produced a value-added ratio of 55.5%. This ratio is close to the mean of the values indicated by other sources.

Revised Estimates of GDP

Offshore locally-based fishing:

$$5,500 \text{ mt} * \text{F\$9,200} * 0.50 = \text{F\$25,300,000}$$

Source of data: Production and price information as per Appendix 2. The production is predominantly long line. In subsequent years, the pole and line fishery recommenced for a while, albeit at a fairly low level. The price is based on the advice from the industry on the average price received.

Coastal commercial fishing:

$$9,320 \text{ mt} * \text{F\$3,220} * 0.60 = \text{F\$18,006,240}$$

Source of data: Production and price information as per Appendix 2. Price is derived from the weighted average market price as gathered from market surveys carried out by the Fisheries Division. Intermediate cost ratio is consultants' own estimate based on analysis of gross output and operating costs of various types of fishing.

Subsistence fishing:

$$21,600 \text{ mt} * \text{F\$2,250} * 0.85 = \text{F\$41,310,000}$$

Source of data: Production and price information as per Appendix 2. Price of F\$2,500/mt is the weighted average market price as gathered from market surveys carried out by the Ministry of Agriculture, Forests and Fisheries. Intermediate cost ratio is Consultants' own estimate based on analysis of gross output and operating costs of various types of fishing.

This can be summarized and compared to the official estimate:

Table A1.7: Official vs. Re-estimates of GDP and Fishing Contribution of Fiji Islands, 1999 (F\$)

Item	RBF GDP Estimate	Consultants Revised GDP Estimate
GDP (current market prices)	3,587,300,000	3,587,300,000
Fishing Contribution to GDP	84,100,000 ^a	84,616,240

F\$ = Fiji dollar; GDP = gross domestic product; RBF = The Reserve Bank of Fiji.
^a Calculated at factor cost.
 Sources: RBF (2000); Consultants' estimates.

Kiribati

The Nominal Contribution of Fishing to GDP

Table A1.8: Official GDP and Fishing Contribution of Kiribati, 1996–2000 (A\$)

Item	1996	1997	1998	1999	2000
GDP (current market prices)	64,348,000	64,467,000	72,016,000	74,592,000	74,100,000
Commercial Fishing	2,640,000	2,078,000	2,625,000	2,347,000	2,377,000
Subsistence Fishing	6,000,000	6,138,000	6,279,000	6,438,000	6,500,000
Seaweed ^a		259,000	186,000		
Fishing Contribution to GDP					
By Value	8,640,000	8,216,000	8,904,000	8,785,000	8,877,000
By Share (%)	13.4	12.7	12.4	11.8	12.0

A\$ = Australian dollar; GDP = gross domestic product.
^a Data gathered from the National Economic Planning Office (NEPO), 1999.
 Source: Unpublished information, Statistics Office, Ministry of Finance and Economic Planning (2001).

The consultants estimate that the fishing contribution to GDP in 2000 was about A\$20.2 million. The consultants' estimate is far higher than the official estimate. This could be explained in part by the limited data available to the consultants. However, given the substantial differences between the estimates, most of the variation is attributable to differing estimates of the levels of production in the fishing sector.

Background

The Government's Statistics Office prepares the GDP estimates for Kiribati. The most recent estimates available to the consultants are the unpublished information in Table A1. 8, which was prepared by the Statistics Office.

Due to problems with the airline service to Tarawa, the consultants were unable to visit Kiribati. The data used in the following discussion were obtained from an adviser to the Ministry of Finance, the consultants' own library, and other secondary sources.

Methods used to Calculate Contribution to GDP

The contribution of fishing to GDP is separated into two sub-sectors: *commercial fishing* and *subsistence fishing*.

- ***Commercial Fishing.*** This category covers the fish that are caught for sale. The consultants were advised that the calculation used to determine the value added by commercial fishing was based on informal surveys of the number of fish ice-boxes on the side of the road in South Tarawa. Statistics Office staff occasionally count the number of boxes; they then impute the amount of fish in each box and multiply the estimated volume of fish by an assumed average price. Estimated input costs are then deducted to arrive at the value added to GDP.
- ***Subsistence Fishing.*** The contribution to GDP is calculated by taking the household expenditure figures from household expenditure surveys. In years for which there are no household expenditure surveys, the contribution is extrapolated by the population increase.

Comments on the GDP Calculation

The method used to calculate the contribution of *commercial fishing* to GDP is indirect and unreliable. In addition, if that is the sole method used, the value added by seaweed, aquarium fish, and other marine products are not included.

There have been a number of studies into the production of fish and marine products in Kiribati (see Appendix 2). In all cases, these studies indicate levels of production that markedly exceed the

production level implicit in the official figures. The values of seaweed production and other marine products are reported in the Government’s 1998 Economic Statement (National Economic Planning Office [NEPO] 1999). Annual data on these activities should be available and relatively easy to collect from exporters. In the circumstances, it seems highly likely that the official figures underestimate the contribution of commercial fishing to GDP, and that these estimates could be relatively easily improved.

While the approach to measuring the contribution of *subsistence fishing* is reasonable, it is based on dated information and production is imputed from consumption data. There is a significant body of literature that measures the volume of subsistence production (see Appendix 2), which could be used to prepare a more reliable estimate of the sector’s contribution to GDP. It should be a relatively straightforward process to calculate the contribution from existing production estimates and contemporary price data.

The production approach could be used to estimate intertemporal changes in fishing contribution to GDP. This could be done by imputing per capita consumption figures from production data and population statistics for each year. The consumption rate could then be used with changes in population to extrapolate the commercial fishing and subsistence fishing contribution to GDP. This approach is similar to the method used when extrapolating HIES data by population. While analysts often have little, if any, alternative, it does imply the assumption that the consumption/production rate remains constant over time. It remains axiomatic that better data enable better estimates to be made. In part, this could be addressed by improving the interchange of information between the Statistics Office and the Fisheries Division. Ideally, more frequent HIES and fisheries sector studies should be carried out.

Revised Estimates of GDP

Commercial fishing:

General	6,000 mt *	A\$2,100	* 0.65 =	A\$8,190,000
Aquarium fish:		A\$1,800,000	* 0.80 =	A\$1,440,000
Seaweed:		A\$210,000	* 0.90 =	A\$189,000

Source of data: Production and price information as per Appendix 2. The value-added ratio for general commercial fishing assumes that the fishery is partly motorized. The value-added ratio for general fishing also assumes

that there is some bottom fishing and netting from sailing canoes and that the motorized fishing is generally not trolling. For aquarium fish, the consultants have used a value-added ratio derived from estimates made in the Cook Islands for the collection of aquarium fish.

Subsistence fishing:

$$10,000 \text{ mt} * \text{ A\$1,225} * 0.85 = \text{ A\$10,412,500}$$

Source of data: Production and price information as per Appendix 2.

This can be summarized and compared to the official estimate:

Table A1.9: Official vs. Re-estimates of GDP and Fishing Contribution of Kiribati, 2000 (A\$)

Item	Official GDP Estimate	Consultants Revised GDP Estimate
GDP (current market prices)	74,100,000	93,943,000
Fishing Contribution to GDP	8,877,000	20,231,500

A\$ = Australian dollar; GDP = gross domestic product.

Sources: Unpublished information, Statistics Office (2001); Consultants' estimates.

Marshall Islands

The Nominal Contribution of Fishing to GDP

Table A1.10: Official GDP and Fishing Contribution of Marshall Islands, 1995–1999 (US\$)

Item	1995	1996	1997	1998	1999
GDP (current market prices)	105,238,800	97,035,700	92,183,900	95,659,300	97,311,800
Fishing Contribution to GDP					
By Value	8,443,600	7,473,700	6,726,300	6,634,100	7,203,400
By Share (%)	8.0	7.7	7.3	6.9	7.4

GDP = gross domestic product; US\$ = United States dollar.

Source: Office of Planning and Statistics (2000a).

The consultants estimate that the fishing contribution to GDP in 1999 was US\$3.6 million. The consultants' estimate is lower by 50% than the official estimate. It appears that the official estimates have not taken into account the fact that the offshore foreign vessels that had been operating in the Republic of the Marshall Islands (RMI) departed before the end of 1998 (Marshall Islands Marine Resources Authority [MIMRA] 2000). While these vessels were operating in the RMI, they added around US\$3.4 million to GDP.

Background

The Government's Office of Planning and Statistics prepares the national accounts for the RMI. The methods used to prepare the national accounts are based upon a report prepared by the Forum Secretariat in 1992. The national accounts section of the latest Statistical Abstract (Office of Planning and Statistics 2000a) states that "the estimates for 1991 and 1992 prepared by a Forum Secretariat consultant are based on the value-added approach. For this exercise, an establishment survey as well as a housing survey [*sic*] were conducted for gathering the necessary data on various sectors of the economy and the information obtained in this manner was used in the GDP estimates. The estimates for 1993 through 1995 are based on the value-added approach following the methodology of the Forum Secretariat, with revisions where appropriate."

Methods used to Calculate Contribution to GDP

The Office of Planning and Statistics provided considerable information on calculating the fisheries component of GDP, including a two-page information sheet on the methods used. The sector is divided into four subsectors:

- *Large-scale Fishing.* This sector includes the offshore fishing vessels. At various times in the past, large numbers of foreign fishing vessels, notably from Taipei, China, have operated out of RMI. While these vessels were operating out of the RMI, it was appropriate to include them in fishing's estimated contribution to GDP. At present, there is no locally-based large-scale fishing activity in the RMI.
- *Small-scale Commercial Fishing.* Small-scale commercial fishing activities include the supply of fish to the local market and

the production of some other marine products. It is carried out throughout most of the islands of the RMI. According to MIMRA, about half of the activity is attributable to boats operating through the MIMRA outer islands project.

- ***Pet Fish Harvest.*** The export of aquarium fish (pet fish) and associated marine organisms is a significant business in the RMI.
- ***Subsistence Fishing.*** Since the departure of the offshore commercial vessels, subsistence fishing has become the single largest contributor to the fishing sector of GDP. The collection of marine products is particularly important in the outer islands where they provide a substantial proportion of household diets.

Comments on the GDP Calculation

The estimates of the contribution of *large-scale fishing* to GDP are complicated by the involvement of foreign-owned offshore fishing companies. The Ting Hong company operation in the mid-1990s is an example. For several years, Ting Hong managed a fleet of chartered Chinese vessels operating out of the RMI. The operation was clearly based in the RMI for over 12 months, and the official GDP estimates follow the System of National Accounts (SNA) convention by including the wages paid to all crew (domestic and foreign) and the surplus generated by the operation. It appears that, despite the departure of these vessels before the end of 1998, the official GDP figures continue to report a substantial contribution from the vessels in 1999.

The contribution of *small-scale commercial fishing* is calculated from the records of the MIMRA's outer islands project. However, MIMRA advised the consultants that the catch going through this project is only about half the fish caught/sold in the RMI by small-scale fishers. Therefore, the calculated contribution understates the value-added by small-scale commercial fishing.

There is a risk that the calculation of the *subsistence fishing* contribution to GDP may double-count the catch of small-scale commercial fishing. This catch of the small-scale commercial fishing operations is primarily sold in the RMI where it is consumed in households. It is therefore quite possible that the fish measured as part of the catch is also measured as part of consumption.

The Office of Planning and Statistics worksheet on methods used to calculate the contribution of subsistence fishing shows the production of fish in 1996 to be 3,185,928 pounds. This appears to be

the actual weight of the food (i.e., not the whole fish weight). If so, it would equate to a per capita fish consumption of about 59.0 kg per year. This amount does not seem unreasonable. It is similar to the consumption levels measured in neighboring countries with similar conditions to the RMI.

A large-scale loining operation started in Majuro in October 1999. It has been reported that this operation is paying as much as US\$85,000 per month in wages (MIMRA 2000). Under the standard SNA convention, the value added by the loining operation would normally be allocated to the food-processing sector. However, given the small size of the nonfish food processing industry in the RMI and the direct link between the loining plant and the fishing industry, it could be useful to identify it as a fisheries activity and classify it in the national accounts as a separate sub-industry under "Manufacturing." Given that the loining operation is not classified under "Fishing," its contribution to GDP has not been included in the consultants' revised estimate of GDP.

Also, a considerable amount of fish is transhipped from foreign vessels in the RMI. Transshipment is not a fishing activity and the value added accruing from the activity is correctly allocated to other sectors of the economy including "Transport," "Wholesale and Retail," and "Hotels."

Revised Estimates of GDP

Large-scale fishing:

—nil—

Source of data: Production and price information as per Appendix 2. Includes foreign-owned offshore fishing, where the operation is based in the RMI. In 1999, there was no domestic large-scale fishing.

Small-scale commercial fishing:

$$444 \text{ mt} \quad * \quad \text{US\$1,125} \quad * \quad 0.60 = \text{US\$299,700}$$

Source of data: Production and price information as per Appendix 2. Prices are derived from 1996 data averaged across various islands and increased by 5.0% to adjust for inflation. Value-added ratio assumes that much of the catch is taken using motorized boats. Production data is derived from two main sources: (i) the back-calculation of MIMRA gross output and price records, and (ii) estimates made by various production surveys (Dalzell et al. 1996).

Aquarium fish (Pet-fish):

$$\text{US\$473,000} * 0.50 = \text{US\$236,500}$$

Source of data: Production and price information as per Appendix 2. The value-added ratio used is the same as that used in the official figures. It is noted that the ratio gives a substantially lower value-added than that reported in the Cook Islands where the value-added ratio for aquarium fish collection is 0.80. In the absence of any evidence to the contrary, the consultants considered it prudent to use the figure adopted in the official RMI calculations.

Subsistence fishing:

$$2,800 \text{ mt} * \text{US\$1,370} * 0.80 = \text{US\$3,068,800}$$

Source of data: Production and price information as per Appendix 2. A straight production approach has been used to avoid the possibility of double counting small-scale commercial fishing and subsistence fishing. Prices are derived from 1996 data averaged across various islands weighted by production and increased by 5.0% to adjust for inflation. The value-added ratio of 0.80 assumes that a substantial proportion of the subsistence catch is taken using motorized boats.

This can be summarized and compared to the official estimate:

Table A1.11: Official vs. Re-estimates of GDP and Fishing Contribution of Marshall Islands, 1999 (US\$)

Item	Official GDP Estimate	Consultants' Revised GDP Estimate
GDP (current market prices)	97,311,800	93,714,400
Fishing Contribution to GDP	7,203,400	3,605,000

GDP = gross domestic product; US\$ = United States dollar.
Sources: Office of Planning and Statistics (2000); Consultants' estimates.

Nauru

The Nominal Contribution of Fishing to GDP

Nauru does not presently calculate its GDP. Discussions with individuals from ADB, Secretariat of the Pacific Community (SPC), United Nations Development Programme (UNDP), and International

Monetary Fund (IMF) resulted in several approximations of the present Nauru GDP. The consensus, however, is that the GDP was near A\$80.0 million in 1999.

Based on assumptions and information specified in the text below, the consultants have determined that the value added to the Nauru economy by the fishing sector was about A\$1.7 million in 1999.

Background

Since GDP is not calculated, there is no relevant background information to report.

Methods used to Calculate Contribution to GDP

Not applicable.

Comments on the GDP Calculation

Not applicable.

Revised Estimates of GDP

Offshore locally-based fishing:

$$50 \text{ mt} * A\$7,740 * 0.50 = A\$193,500$$

Source of data: Production as per Appendix 2. The price is based on the upper end of the price range for fresh fish sales. Production data are derived from discussions with Nauru Fisheries and Marine Resources Authority (NFMRA) and fisheries literature.

Coastal commercial fishing:

$$315 \text{ mt} * A\$5,500 * 0.60 = A\$1,039,500$$

Source of data: Production as per Appendix 2. The price is based on the fresh fish prices in Nauru which range from A\$3.00/kg to A\$8.00/kg, with tuna selling for between A\$4.00/kg and A\$5.00/kg (NFMRA, pers. com.). Production data are derived from discussions with NFMRA and fisheries literature.

Coastal subsistence fishing:

$$110 \text{ mt} * A\$4,675 * 0.90 = A\$462,825$$

Source of data: Production and price information as per Appendix 2. The price is the estimated “farm gate” price. It is based on the price used for coastal commercial fishing less 15% for transport and marketing. Production data are derived from discussions with NFMRA and fisheries literature.

This can be summarized as follows:

Table A1.12: Estimates of GDP and Fishing Contribution of Nauru, 1999 (A\$)

Item	Informal GDP Estimate	Consultants' Estimate
GDP (current market prices)	—	80,000,000
Fishing Contribution to GDP	—	1,695,825

— = not available.

A\$ = Australian dollar; GDP = gross domestic product.

Sources: Various sources; Consultants' estimates.

Niue

The Nominal Contribution of Fishing to GDP

Table A1.13: Official GDP and Fishing Contribution of Niue, 1997-2000 (NZ\$)

Item	1997	1998	1999	2000
GDP (current market prices)	13,732,500	14,692,800	14,198,600	14,210,300
Fishing Contribution to GDP				
Market Production	22,800	18,500	19,800	15,500
Nonmarket Production	228,300	221,100	214,100	209,000
Total Fishing Contribution				
By Value	251,100	239,600	233,900	224,500
By Share %	1.8	1.6	1.6	1.6

GDP = gross domestic product; NZ\$ = New Zealand dollar.

Source: Niue national account workbook (July 2000 estimates), Lewington (2000).

The consultants estimate that fishing contributed NZ\$265,665 to GDP in 2000. While this figure is markedly higher than the official estimate, it is noted that methods used by Statistics New Zealand are valid and appropriate. The principal difference is in the value attributed to the *coastal commercial fishing*. The consultants have used a production approach and with a markedly higher average price than that applicable to the *coastal subsistence* subsector. It is possible that the income tax data used to make the official estimates were incomplete or understated.

Background

The Niue GDP for the years 1997–2000 are calculated by Statistics New Zealand in 2000 (Lewington 2000). A combination of production and income approaches is used, and the results are categorized by ownership and industry group. Statistics New Zealand was thorough and took particular account of the role and importance of fishing in Niue.

The published national accounts are highly aggregated with fishing being included in the “Agriculture, Hunting, Fishing and Forestry” sector of the industry group and “Private Sector Subsistence” of the ownership group.

The insignificant amount of on-shore handling or processing is distributed through several sectors in the industry group and the “Private Enterprises in the Formal Cash” sector of the ownership group. Given the small amount of added value that would be attributable to the nonfishing fisheries activities, it is not worth the effort required to undertake a separate analysis.

Methods used to Calculate Contribution to GDP

The fishing sector is divided in two subsectors:

- *Coastal Subsistence Fishing*. This includes subsistence and nonmarket production.
- *Coastal Commercial Fishing*. This includes small-scale commercial fishing and some sport fishing.

The valuation of the *coastal subsistence fishing* component of GDP is based upon a survey of 20 households (3.6% of all households in

Niue) that was carried out in June 2000. The results from the survey were extrapolated by the population to estimate the overall consumption. This survey indicated that the annual catch from subsistence fisheries was 194 mt. The price of each fishery product in the diet was gathered from the local market, and the calculated gross value of output was NZ\$315,640. Gross value was discounted by 20–30% to arrive at a “farm gate” price. The “farm gate” value was then multiplied by 0.65 to arrive at the value added by the subsector.

The data used to value the *coastal commercial fishing* subsector were derived from income tax returns. The few businesses engaged in fishing also provide fishing charters. Income from tourism is included in the estimate since it is not possible to separate the income and costs of the tourists operation from the purely fishing income.

Comments on the GDP Calculation

As stated in the supporting documentation (Lewington 2000):

The methods used to measure the subsistence economy are spelt out in some detail. Subjective judgment played a major part in these estimates. Users of these National Accounts need to be aware of the assumptions and may wish to adjust them in accordance with their own view on subsistence consumption and its valuation.

Given the inherent uncertainties in the process, the assumptions used appear reasonable.

The official estimate of annual subsistence catch of 194 mt is somewhat higher than that reported by (i) Dalzell et al. (1996) subsistence estimate of 103 mt; and (ii) the estimate of 120 mt for all Niue fisheries used by the Niue Department of Agriculture, Forestry and Fisheries (B. Pasisi, pers. com. June 2001).

The income method used to calculate the contribution from coastal commercial fishing is valid given that the analyst had access to income tax records. This approach relies upon the accuracy of the income tax records. There is a risk that the production estimate for coastal subsistence fishing might double count the coastal commercial catch. This could happen if the household consumption data used to calculate the coastal subsistence production include the fish purchased from commercial operators. It is noted that, given the

relatively small contribution attributed to the commercial subsector, any double counting is probably not significant.

Revised Estimates of GDP

Coastal subsistence fishing:

$$194 \text{ mt} * \text{NZ\$}1,650 * 0.65 = \text{NZ\$}208,065$$

Source of data: Production and price information as per Appendix 2. The price estimates assume that the catch includes a significant proportion of shellfish and other relatively low value species. While the subsistence fishing includes low input reef gleaning and nonmotorized fishing, a relatively high proportion of the fishing is high input motorized trolling. In the circumstances, the value-added ratio is lower than would usually be expected for a subsistence fishery.

Coastal commercial fishing:

$$12 \text{ mt} * \text{NZ\$}8,000 * 0.60 = \text{NZ\$}57,600$$

Source of data: Production information as per Appendix 2. Most of the commercial fishing targets the higher value offshore species, and hence a higher average price is warranted. All the boats involved in this fishery are motorized.

This can be summarized and compared to the official estimate:

Table A1.14: Official vs. Re-estimates of GDP and Fishing Contribution of Niue, 2000 (NZ\$)

Item	Official GDP Estimate	Consultants' Revised GDP Estimate
GDP (current market prices)	14,210,300	14,210,300
Fishing Contribution to GDP	224,500	265,665

GDP = gross domestic product; NZ\$ = New Zealand dollar.
 Sources: Niue National Account workbook (July 2000 estimates), Lewington (2000); Consultants' estimates.

Palau

The Nominal Contribution of Fishing to GDP

Table A1.15: Official GDP and Fishing Contribution of Palau, 1995–1999 (US\$)

Item	1995	1996	1997	1998	1999
GDP (current prices)	95,236,514	108,203,839	113,211,798	117,320,113	113,484,869
Fisheries Contribution to GDP					
By Value	3,918,000	2,973,000	2,057,000	2,038,000	3,148,000
By Share (%)	4.1	2.7	1.8	1.7	2.8

GDP = gross domestic product; US\$ = United States dollar.
Source: Office of Planning and Statistics (undated).

The consultants estimate that the fishing contribution to GDP in 1998 was about US\$11.0 million.

Background

The earliest estimates of the GDP of Palau were made in the early 1970s. In subsequent years, the Economic and Social Commission for Asia and the Pacific (ESCAP), IMF, UNDP, and the Office of Planning and Statistics have each prepared GDP estimates. The methods and approaches used have varied, sometimes markedly. One consequence of these differences has been the wide variation in estimates of the contribution of fishing to the Palau economy. The estimates range from a high of 28.8% in 1992 (from a development plan cited in Lambeth [1999] and Bishop et al. [1995]) to a low of 2.7% in 1998 (Office of Planning and Statistics 2000c).

In the circumstance, it would be unwise to give much credence to inter-temporal comparisons of fisheries contribution to GDP in Palau.

Methods used to Calculate Contribution to GDP

Unlike the situation for most Pacific Island countries where fishing is combined with agriculture and other primary industries, the

national accounts prepared by the Office of Planning and Statistics show “Fisheries” as a separate sector. In the case of Palau, the term “Fisheries” is taken to be analogous to “Fishing” as defined in the SNA.

In calculating the contribution of fishing to GDP, the Office of Planning and Statistics divided the sector into three categories:

- **Corporate Sector** (of which offshore and large-scale commercial fishing is a component). The Office of Planning and Statistics used a combination of income and expenditure approaches to value the fisheries component of the corporate sector. The data used were collected directly from the larger fishing companies.
- **Small-scale Commercial Fishing.** Wage information obtained from the social security register was used to calculate the value added to GDP by small-scale commercial fishing.
- **Subsistence Fishing.** The contribution of subsistence fishing has been calculated by multiplying the number of people who identified themselves as fishers in the national census by the amount of US\$2,000.

Comments on the GDP Calculation

The approach used to calculate the contribution of the *corporate sector* works well in situations where the enterprises keep accurate records, and it is possible to identify and survey the enterprises involved in fishing. The reason for the substantial difference between the consultants’ estimate and the official estimate is not clear.

The methods used to calculate the contribution of both the *small-scale commercial fishing* and *subsistence fishing* are probably less accurate. It is unlikely that wages recorded in the social security register account for all the value added to GDP by small-scale commercial fishing. A significant proportion of the payments to crew is probably in cash and, therefore, not recorded in the register. In addition, when using the income approach to calculate the value added to GDP, the calculation should include employee remuneration (wages), operating surplus and the consumption of fixed capital.

The estimated contribution of the subsistence fishing category is based on what appears to be an arbitrary value per capita of

US\$2,000 for each fisher (as identified in the census). The empirical basis for the US\$2,000 is not clear, although it is noted that the contribution to GDP calculated using this approach is close to that calculated by the consultants using the production approach.

Given that production data are available for the Palau inshore and offshore fisheries (Palau Conservation Society [PCS] 2000 and export permits) and the fact that domestic and export prices are reasonably well documented, a production approach is likely to produce a more reliable measure of fisheries contribution to GDP for the small-scale commercial and subsistence fisheries.

Revised Estimates of GDP

Corporate sector:

$$2,500 \text{ mt} * \text{US\$6,080} * 0.50 = \text{US\$7,600,000}$$

Source of data: Production and price information as per Appendix 2. The value-added ratio of 0.50 is derived from consultations with an SPC master fisherman and the analysis of various reports in which income and expenditure records for commercial vessels are detailed.

There are marked swings in the level of corporate fishing activity between years. Up to 600 foreign longline boats have been based in Palau at times during the 1990s; while in other years there has been virtually no locally-based foreign vessels. The production of these foreign-owned vessels should be included in the contribution to GDP when they are operating in conjunction with a local company or are based in Palau for at least 12 months.

Small-scale commercial fishing:

$$865 \text{ mt} * \text{US\$3,000} * 0.55 = \text{US\$1,427,250}$$

Source of data: Production based on PCS (2000). Price data from PCS (2000) and consultants' estimates. The value-added ratio of 0.55 assumes that most of the small-scale commercial fishing used motorized boats.

Subsistence fishing:

$$1,250 \text{ mt} * \text{US\$2,000} * 0.80 = \text{US\$2,000,000}$$

Source of data: Production as per Appendix 2. The price used is the imputed farm gate price. It has been calculated by deducting 33% from the small-scale commercial fishing price. The value-added ratio of 0.80 assumes that the subsistence catch is taken by a mix of gleaning, diving and the use of

motorized boats. A significant proportion of what is included in subsistence fishing bears a closer resemblance to recreational fishing than household food production.

This can be summarized and compared to the official estimate:

Table A1.16: Official vs. Re-estimates of GDP and Fishing Contribution of Palau, 1998 (US\$)

Item	Official GDP Estimate	Consultants Revised GDP Estimate
GDP (current market prices)	129,601,000	137,143,250
Fishing Contribution to GDP	3,485,000	11,027,250

GDP = gross domestic product; US\$ = United States dollar.
Sources: Office of Planning and Statistics; Consultants' estimates.

Papua New Guinea

The Nominal Contribution of Fishing to GDP

Table A1.17: Official GDP and Fishing Contribution of Papua New Guinea, 1995–1999 (K million)

Item	1995	1996	1997	1998	1999
GDP (current purchaser prices)	5,888.3	6,881.3	6,980.0	7,788.5	8,780.8
Fishing Contribution to GDP					
Market Production	8.3	10.4	10.9	29.1	49.3
Nonmarket Production	—	—	—	—	—
Total Fishing Contribution					
By Value	8.3	10.4	10.9	29.1	49.3
By Share (%)	0.14	0.15	0.16	0.37	0.56

GDP = gross domestic product; K = kina; mn = million.
Sources: National Statistics Office (2001); NSO unpublished data.

The consultants estimate the fishing contribution to GDP in 1999 to be about K125.4 million. The consultants' estimate is two-and-a-half times greater than the official estimate. This difference is mainly attributable to the absence of the value added by subsistence fishing in the official estimates.

Background

The published GDP estimates for Papua New Guinea (PNG) are prepared by the NSO. According to NSO officials, GDP estimates are also prepared by the Department of National Planning, Treasury, and the Central Bank of PNG.

Methods used to Calculate Contribution to GDP

NSO officials advised the consultants that they do not have information necessary to calculate the contribution of nonmarket fishing production to GDP. Hence, there is no value given to nonmarket fishing in the published estimates of GDP.

The consultants were also advised by NSO that efforts to estimate the contribution of market fishing have been hampered by the lack of cooperation from the industry. Attempts to obtain data directly from the industry were suspended due to the poor response of the industry to the requests for information.

The NSO currently uses data obtained from the Central Bank of PNG's quarterly survey of exports. According to NSO, it is using a method developed by an officer who has since left the organization, where (i) domestic consumption is estimated from the export information, and (ii) a deflator is used to directly estimate the real contribution of fisheries to GDP, from which the nominal contribution is calculated.

Comments on the GDP Calculation

The complete absence of nonmarket production fishing in the published figures significantly understates the contribution of the fishing sector to GDP. If the value of the estimated 26,000 mt of subsistence catch (see below) is included in the estimates, the fishing contribution to national GDP almost doubles.

The information obtained by the consultants is not sufficient to enable an evaluation of the method(s) being used to determine the contribution of market fishing. Suffice it to say that, if the method is as described, it is difficult to envisage how export data for a few internationally traded products can be extrapolated to generate a reasonably accurate estimate of the contribution of all market fishing to GDP.

Revised Estimates of GDP

Subsistence fishing:

$$26,000 \text{ mt} * \text{K}2,000 * 0.90 = \text{K}46,800,000$$

Source of data: Production and price information as per Appendix 2. Production and price estimates derived from fisheries literature.

Coastal commercial fishing:

$$5,500 \text{ mt} * \text{K}10,000 * 0.60 = \text{K}33,000,000$$

Source of data: Production and price information as per Appendix 2. The price is markedly higher than the subsistence price due to the inclusion of trochus, shrimp, lobster, beche-de-mer and other relatively high value export products.

Offshore locally-based fishing:

$$50,500 \text{ mt} * \text{K}2,257 * 0.40 = \text{K}45,591,400$$

Source of data: Production and price information as per Appendix 2. Assumes 500 mt longline catch at K12,810 per mt plus 50,000 mt purse seine catch at K2,160 per mt.

This can be summarized and compared to the official estimate:

Table A1.18: Official vs. Re-estimates of GDP and Fishing Contribution of Papua New Guinea, 1999 (K)

Item	Official GDP Estimate	Consultants Revised GDP Estimate
GDP (current market prices)	8,780,800,000	8,856,892,000
Fishing Contribution to GDP	49,300,000	125,391,400

GDP = gross domestic product; K = kina.
Sources: National Statistics Office (2001); Consultants' estimates.

Samoa

The Nominal Contribution of Fishing to GDP

Table A1.19: Official GDP and Fishing Contribution of Samoa, 1996–2000 (ST million)

Item	1996	1997	1998	1999	2000
GDP (current market price)	555.52	625.27	659.41	705.91	771.98
Fishing Contribution to GDP					
Monetary Fishing	7.73	14.01	20.41	24.15	25.34
Non-monetary Fishing	37.31	40.35	34.27	32.25	38.79
Total Fishing Contribution					
By Value	45.05	54.35	54.68	56.40	64.13
By Share (%)	8.1	8.7	8.3	8.0	8.3

GDP = gross domestic product; mn = million; ST = tala.
Source: Treasury Department (2001).

The consultants estimate that the fishing contribution to GDP in 1999 was about ST46.2 million. The consultants' estimate is about ST18 million (or 28%) lower than the official estimate.

Background

The Samoa GDP estimates are calculated by the Treasury Department in consultation with the Bureau of Statistics and the Central Bank.

Methods used to Calculate Contribution to GDP

The fishing component of the GDP is divided into two sub-categories: *monetary* and *nonmonetary*. There is also the fisheries-related category of *monetary fishing: commerce*.

The composition of the sub-categories is as follows:

- **Monetary Fishing.** This refers to offshore fishing.
- **Non-Monetary Fishing.** This includes subsistence, nonmarket household production, and small-scale commercial fishing.

- *Monetary fishing: commerce.* This refers to fisheries-related activities such as onshore fish handling, packaging, and transshipment.

The valuation of the contribution of the *monetary fishing* sector uses a production approach. The contribution to GDP is calculated by deducting the intermediate costs from the gross output, which is the product of the total production multiplied by the average price. Since most of the catch/production from this sector ends up being exported, principally to the canneries in Pago Pago, it is relatively easy to measure the volume produced and the market price. The estimate of costs of intermediate inputs is also reasonably straightforward given the data available on the cost of operating commercial fishing vessels, and the costs of handling, packaging and shipping in Samoa.

The measure of the value added contribution of the *nonmonetary fishing* sector is based on data collected in a study of the sector that was carried out in 2000 (Passfield 2001). That study produced estimates of the quantity of fish caught and consumed by households, and those caught and sold by small-scale commercial fishers. It also provided an estimate of the market value of the product. The results of this study have been incorporated into the 2000 national accounts and for some earlier years.

Passfield estimated village fisheries production to be 7,169 mt per annum, which comprises 4,293 mt used for home consumption and 2,879 mt sold or given away. The small-scale commercial fishing activity is encompassed within village production. Passfield also estimated the weighted average market price of small-scale commercial fisheries production to be ST6.29 per kg. This approach values home consumption at the market price of the fish. The approach is inconsistent with the SNA scheme of valuing goods and services that are consumed by the producer instead of being sold. According to the SNA, the “farm gate” price is more appropriate.

According to SNA, the category *monetary fishing: commerce* is not within the sector in SNA known as “fishing,” but it is obviously related to fisheries. The contribution of the category is slightly more difficult to estimate. The enterprises engaged in this sector vary considerably in size and sophistication making it more difficult to measure their production, prices, and intermediate costs. The Treasury Department faces similar difficulties in measuring the contribution

of most other sectors in the economy. It has, therefore, elected to use a variation of the expenditure approach to valuation. Samoa has a value-added tax (VAT), and all enterprises with an annual gross turnover exceeding ST52,000 are obliged to submit two monthly VAT returns. Enterprises are classified by sector, and the VAT payments for each sector summed up. It is then possible to back calculate the value added by each sector by dividing the total VAT collected from the sector by the VAT rate. Virtually all the enterprises in this category are obliged to submit VAT returns and business activity reports, so the coverage is quite good. The procedure also has the advantage of relying on a legally enforceable obligation that is imposed on all enterprises.

Comments on the GDP Calculation

The production approach that was used to measure the contribution of *monetary fishing* is the best available method given the complex nature of the sector. The fishing sector is notoriously difficult to measure because:

- (i) There is usually a wide range in the size of the enterprises involved;
- (ii) Many participants are owner-operators who sell their catch for cash and do not report their earnings;
- (iii) Even when crew are employed, they often work for a “share of the catch,” the amount of which can vary markedly depending upon the amount they contribute to the operating costs.

In the circumstances, the income or expenditure approaches to the valuation of GDP are not usually feasible. Their coverage is incomplete and, even where an enterprise is covered, the valuation of output is difficult. A production approach that relies on secondary data sources such as shipping records, international prices, and market surveys is likely to produce more reliable data.

The procedure used to measure the *nonmonetary fishing* contribution to GDP is appropriate. The only additional points worth considering are:

- (i) The segregation of small-scale commercial fishing from the subsistence component of village fishing. The Passfield report identifies the share of village production going to own

consumption and the share that is sold or given away. This distinction could be used as the boundary between subsistence fishing and small-scale commercial fishing.

- (ii) Given that much of the subsistence production is from gleaning the reef and inshore fishing while much of the small-scale commercial fishing uses boats many of which have motors, there is a marked difference in the level of intermediate costs between the two activities. Splitting the village fisheries into two sub-categories—subsistence and small-scale commercial—would enable a more accurate calculation of value added.
- (iii) The price used to value nonmonetary production is the estimated weighted average market price of total production. It is worth considering to use a farm gate price for own consumption given that the value to the household is the market price less the cost of transport and marketing.

The *monetary fishing: commerce* subsector mainly comprises the medium to large enterprises involved in the onshore handling, packing, and shipping of fish for export. In most national accounts, the value added from these activities is usually distributed between a number of other sectors including food processing, transport, wholesale and retail. The decision to show these separately provides a better insight into the importance of fishing and fisheries to the economy of Samoa.

The use of VAT returns and business activity returns to measure the contribution of these enterprises can be an effective method of measuring their contribution to GDP. However, this method is only feasible where VAT or a similar consumption tax is imposed and where business activity returns are collected and analyzed. The effectiveness of the method relies on a thorough coverage of the enterprises operating in the sector. This may not always be the case, especially given that small enterprises may not be obliged to submit VAT returns. In the case of Samoa, it seems that most of the commercial operators are submitting returns. So the method provides an effective way of measuring the value added of the subsector.

Revised Estimates of GDP

Monetary tuna fishing:
 5,156 mt * ST5,769 * 0.50 = ST14,872,482

Source of data: Production and price information as per Appendix 2.
 Production: 5,156 mt total tuna catch of Alia catamaran longline fleet in 1999 as reported by Watt and Moala (2000), Watt (2001), Sua and Watt (2001).
 Price: Weighted average of tuna shipped to Pago Pago canneries (3,370 mt * ST5,400/mt FOB) and tuna airfreighted for the sashimi market (1,037mt * ST9,000/mt) and local sales/gifts (749 mt * ST2.96/mt).

Subsistence fishing:

$$4,293 \text{ mt} * \text{ST}5,030 * 0.90 = \text{ST}19,434,411$$

Source of data: Production and price information as per Appendix 2.

Small-scale commercial fishing:

$$3,086 \text{ mt} * \text{ST}6,448 * 0.60 = \text{ST}11,939,117$$

Source of data: Production and price information as per Appendix 2.

Monetary fishing: commerce:

$$(\text{no independent estimate}) = \text{ST}18,858,000$$

Although the Samoan authorities explicitly recognize the importance of the commercial activities associated with fishing by estimating its contribution separately from other commerce activities, these activities are not part of the "fishing" sector and are not included in the table below.

This can be summarized and compared to the official estimate:

Table A1.20: Official vs. Re-estimates of GDP and Fishing Contribution of Samoa, 1999 (ST)

Item	Official GDP Estimate	Consultants Revised Estimate
GDP (current market prices)	705,914,000	695,763,630
Fishing Contribution to GDP	56,399,000	46,246,010

GDP = gross domestic product; ST = tala.

Sources: Treasury Department (2000); Consultants' estimates.

Solomon Islands

The Nominal Contribution of Fishing to GDP

The following tables present three separate series of GDP estimates including:

- (i) the Bank of Hawaii’s (BoH) estimates of nominal GDP from 1993 to 1997 (BoH 1998);
- (ii) ADB’s estimates of real GDP from 1993 to 1999 (ADB 2000b); and
- (iii) the Central Bank of the Solomon Islands (CBSI) estimate of fishing contribution to GDP (CBSI 2000).

Table A1.21: Bank of Hawaii’s Estimates of Nominal GDP of Solomon Islands, 1993–1997 (SI\$’000)

Item	1993	1994	1995	1996	1997
GDP (current market prices)	755,300	879,300	1,059,300	1,225,800	1,352,700

GDP = gross domestic product; SI\$ = Solomon Islands dollar.
 Source: Bank of Hawaii, 1998.

Table A1.22: ADB’s Estimates of Real GDP and Fishing Contribution of Solomon Islands, 1993–1999 (US\$)

Item	1993	1994	1995	1996	1997	1998	1999
Real GDP (1985 prices)	268,800	282,800	301,700	312,300	309,200	302,400	305,400
Monetary Fishing Contribution	13,800	17,400	24,200	—	—	—	—
Monetary Fishing Contribution (%)	5.1	6.2	8.0	—	—	—	—
Nonmonetary Food Contribution ^a	41,400	42,500	43,600	—	—	—	—

ADB = Asian Development Bank; GDP = gross domestic product; SI\$ = Solomon Islands dollar.
^a Nonmonetary fishing is included in the non-monetary food category; the disaggregated contribution of nonmonetary fishing is not available. Source: ADB, 2001c.

The CBSI estimates do not show the total estimates for GDP.

Based on assumptions and information in the following, the consultants estimate that the fishing contribution to GDP in 1999 was about SI\$173 million. This figure includes locally-based offshore fishing, which is estimated to have contributed about S\$134 million to GDP.

Table A1.23: CBSI's Estimates of the Fishing Contribution to GDP of Solomon Islands, 1995–2000 (SI\$)

Item	1995	1996	1997	1998	1999	2000
Real GDP (1985 prices)	—	—	—	—	—	—
Monetary Fishing Contribution	205.7	151.4	156.7	176.6	170.5	98.3
Nonmonetary Food Contribution	129.4	132.8	136.3	139.9	143.6	147.6

CBSI = Central Bank of the Solomon Islands; GDP = gross domestic product.

Background

The consultants were unable to obtain a comprehensive and consistent GDP estimates for the Solomon Islands.

The consultants' estimate of fishing contribution includes the SI\$134 million contribution by locally-based offshore fishing in 1999. It is noted that, due to the unrest in Honiara, this activity has now ceased. It is expected that, if the problems can be resolved, all or part of this activity will resume.

Methods used to Calculate Contribution to GDP

The method and data used to calculate the estimates in the preceding tables were not available.

Comments on the GDP Calculation

Overall, it is difficult to give a high degree of credence to any of the estimates in the foregoing tables. In all cases, analysts have very little information available to them and the data that are available are of doubtful quality.

Information on the process of estimation of GDP for the Solomon Islands was not available for this study due principally to the unrest in Honiara. However, the Central Bank's Economic Section indicated that (i) the nonmonetary contribution to GDP was extrapolated from earlier figures using population growth, and (ii) the monetary fishing contribution "was not calculated but rather a figure used by the Statistics Office is adjusted."

The Bank of Hawaii Solomon Islands Economic Report (BoH 1998) indicates “there are no consistent economic data on components of GDP by industry, employment, wages, and other payments.”

Of particular concern is the substantial difference between ADB and CBSI estimates of the contribution of monetary fishing to GDP. This is especially so given that both series are purportedly using the same base year. It is noted that the CBSI publication does not specify the units of measurement. In normal circumstances, the series would be reported in local currency. However, the marked difference between ADB and CBSI series suggests that it would be unwise to make this assumption.

An IMF publication on the Solomon Islands national accounts (IMF 1994) makes some observations and recommendations:

- The national accounts and some of the major economic indicators for the Solomon Islands have deteriorated in timeliness and coverage in recent years.
- There are no acceptable indicators readily available from which to estimate private sector operating surplus.
- The food component of the “nonmonetary production” category is based on a nutritional survey in PNG [sic] combined with a household income and expenditure survey done in 1982 in the Solomon Islands.

It appears that the quality of the national accounts has declined considerably since the IMF comments were made.

Revised Estimates of GDP

Small-scale commercial fishing:

$$3,200 \text{ mt} * \text{SI\$2,875} * 0.65 = \text{SI\$5,980,000}$$

Source of data: Production and price information as per Appendix 2. Production and price estimates are derived from Preston et al. (1998).

Subsistence fishing:

$$13,000 \text{ mt} * \text{SI\$3,000} * 0.85 = \text{SI\$33,150,000}$$

Source of data: Production and price information as per Appendix 2. Production and price estimates are derived from Preston et al. (1998) with adjustments to “farm gate” prices.

Offshore locally-based fishing:

$$73,328 \text{ mt} * \text{ SI\$4,570} * 0.40 = \text{SI\$134,043,584}$$

Source of data: Production and price information as per Appendix 2. Production and price estimates derived from fisheries literature.

This can be summarized and compared to the official estimate:

Table A1.24: Bank of Hawaii's Estimates vs. Consultants' Re-estimates of GDP and Fishing Contribution of Solomon Islands (SI\$)

Item	BoH 1997 GDP Estimate	Consultants Estimate 1999
GDP (current market prices)	1,352,700,000 ^a	1,352,700,000 ^a
Fishing Contribution to GDP	—	173,173,584

BoH = Bank of Hawaii; GDP = gross domestic product; SI\$ = Solomon Islands dollar.

^a Given the unreliable nature of the various estimates of GDP, the "GDP (current market prices)" quoted in Table A1. 21 is provided as a broad indicator only.

Sources: BoH (2000); Consultants' estimates.

Tonga

The Nominal Contribution of Fishing to GDP

Table A1.25: Official GDP and Fishing Contribution of Tonga, 1995/96–1999/00 (T\$'000)

Item	1995/96	1996/97	1997/98	1998/99	1999/00
GDP (current market prices)	209,827	210,171	221,397	242,551	251,135
Fishing Contribution to GDP					
By Value	12,946	13,364	15,427	14,528	17,899 ^a
By Share (%)	6.2	6.4	7.0	6.0	7.1

GDP = gross domestic product; T\$ = pa'anga.

^a This is the sum of: T\$9,090,000 local market fishing; T\$5,108,000 nonmarket fishing; and T\$3,701,000 for export.

Source: Statistics Department (2000a), Worksheet "Summary of value added by Agriculture, Forestry, and Fishing."

The consultants estimate that the fishing contribution to GDP in 1999/00 was about T\$18.8 million. The consultants' estimate is higher than the official estimate by about 5.0%.

Subsequent to preparing this analysis, the consultants were advised that the GDP estimates for Tonga had been re-estimated. In the re-estimates, the fishing contribution has been reduced to T\$16,915,600. Perusal of the data shows that the principal difference between the consultants' estimate and the new estimate prepared by the Statistics Department is in the value added by exports. In their re-estimation of the fishing contribution, the Department continues to rely upon official export statistics. As discussed elsewhere in this report, the consultants believe that the official export statistics understate the gross value of exports.

Background

The Statistics Department has published provisional estimates of Tonga's GDP for the financial years from 1993/94 to 1999/00 (Statistics Department 2000a). Officials of the Statistics Department also provided the consultants with a photocopied worksheet that shows the breakdown of Agriculture/Forestry/Fisheries sector into its component parts. This breakdown shows the contribution of the *locally marketed*, *nonmarketed*, and *exports* subsectors to GDP for 1999/00. The contributions are as follows: T\$9,090,000 for locally marketed; T\$5,108,000 for nonmarketed; and T\$3,701,000 for fish exports.

Methods used to Calculate Contribution to GDP

The categories used by the Statistics Department are:

- ***Locally Marketed.*** This category covers the fish that are caught for sale as food. The Statistics Department indicated that a production approach is used to estimate the value added by the locally marketed subsector. The initial data were obtained by surveying some private businesses. This value is updated by extrapolation based on population, consumer price index (CPI), and disaster index. Twenty percent of the gross value is subtracted to cover intermediate costs.
- ***Nonmarketed.*** This category covers the fish and aquatic products that are harvested for household use. The value added is

imputed from information obtained in a 1993/94 HIES. In the years since the HIES, the estimated GDP contributions have been derived by extrapolation based on population, CPI, and disaster index. As with the locally marketed fish, 20% is deducted from the gross output to cover intermediate costs.

- *Export.* The export contribution to estimated GDP comes from the Reserve Bank exports statistics. According to the Statistics Department, the total value of fisheries exports is reduced by 35% to account for costs of intermediate inputs.

The Statistics Department also advised that there is very little fish processing carried out in Tonga and to the extent that the fish is processed before consumption, sale or export, the added value would be incorporated in the above three subsectors.

Comments on the GDP Calculation

The estimate of the *nonmarket* contribution to GDP relies on the extrapolation of data collected almost a decade ago. In addition, the results of the survey have not been published so it is difficult to crosscheck the accuracy of the base data against other data sources.

The accuracy of the factors used to adjust for the cost of intermediate inputs could be improved with some input from the fishing sector. The figures used for *market fishing* (20%) and *export* (35%) appear low, while the *nonmarket* factor (20%) appears high.

Advice from the Tonga Fish Exporters Association indicates that the value of exported fishery products is about three times that shown in the Reserve Bank reports (Appendix 2). The export data used by the Reserve Bank is taken from packing lists, while the information from the exporter association is based on the audited accounts of the major finfish exporters. The price used by the Reserve Bank in its calculation is T\$5.67 per kg, whereas that largest exporter indicates that they receive an average price of T\$7.35 per kg free on board (FOB) for exports. Closer consultation between the authorities responsible for the preparation of the estimates, i.e., the Ministry of Fisheries and the industry, could help improve the accuracy of the estimated contribution of exports to GDP.

It is unclear whether “fish” exports encompass all living marine resources. The Ministry of Fishery Annual Report’s estimate of exports includes shark fins, aquarium fish and related products, and

seaweed. These should be included in the estimated contribution of the sector to GDP.

It appears that the Ministry of Fisheries has little input into or influence over the estimation of fishing contribution to GDP. Given that the Ministry has access to a wider range of data and information on fishing than those which are readily available to the Statistics Department, a closer liaison between the two organizations should improve the accuracy of the estimates.

Revised Estimates of GDP

Small-scale commercial:

- Local market
 $3,561 \text{ mt} * \text{T\$}3,190 * 0.55 = \text{T\$}6,247,775$
- Bottomfish
 $612 \text{ mt} * \text{T\$}7,350 * 0.60 = \text{T\$}2,698,920$
- Aquarium and related products
 $\text{T\$}1,500,000 * 0.80 = \text{T\$}1,200,000$

Source of data: Production and price information as per Appendix 2. Production estimates based on fisheries literature and discussions with the fishing companies. The price estimate provided by Tonga Export Fisheries Association does not differentiate between bottomfish and tuna, so the consultants have used the same price for each.

Nonmarket:

$$2,863 \text{ mt} * \text{T\$}2,230 * 0.85 = \text{T\$}5,426,817$$

Source of data: Production and price information as per Appendix 2. The price used is the estimated “farm gate” price which has been calculated by deducting 30% from the local market price received by the small-scale commercial fishers.

Offshore locally based:

$$800 \text{ mt} * \text{T\$}7,350 * 0.55 = \text{T\$}3,234,000$$

Source of data: Production and price information as per Appendix 2. Production estimate is based on fisheries literature and discussions with the fishing companies. The price estimate provided by Tonga Export Fisheries Association does not differentiate between bottomfish and tuna, so the consultants have used the same price for each.

This can be summarized and compared to the official estimate:

Table A1.26: Official vs. Re-estimates of GDP and Fishing Contribution of Tonga, 1999/2000 (T\$)

Item	Official GDP Estimate	Consultants Revised GDP Estimate
GDP (current market prices)	251,135,000	252,044,000
Fishing Contribution to GDP	17,899,000	18,807,512

GDP = gross domestic product; T\$ = pa'anga.

Sources: Statistics Department (2000); Consultants' estimates.

Tuvalu

The Nominal Contribution of Fishing to GDP

Official publications of the Central Statistics Division, Ministry of Finance and Economic Planning indicate:

Table A1.27: Official GDP and Fishing Contribution of Tuvalu, 1996–1998 (A\$)

Item	1996	1997	1998
GDP (current market prices)	16,998,000	18,669,700	22,044,500
Fishing Contribution to GDP			
Market Production	27,100	63,000	66,000
Non-market Production	1,193,200	1,355,800	1,426,200
Total Fishing Contribution			
By Value	1,220,300	1,418,800	1,492,200
By Share (%)	7.2	7.6	6.8

A\$ = Australian dollar; GDP = gross domestic product.

Source: Lewington (1999a, 1999b).

The consultants estimate that the fishing contribution to GDP in 1998 was about A\$1.6 million. The consultants' estimate is slightly higher (by 4.3%) than the official estimate.

Background

The most recent estimates of the GDP of Tuvalu cover the period from 1996 to 1998 (Ministry of Finance and Economic Planning 1999a). They were prepared with the assistance of an economic consultant from Statistics New Zealand. The approach and assumptions used are outlined in the National Accounts 1996 to 1998 Report and the associated Technical Report (Lewington 1999b).

Methods used to Calculate Contribution to GDP

The contribution of "Fishing" to GDP in current prices for 1998 is shown as A\$66,000 and A\$1,426,200 for market and nonmarket production, respectively.

To calculate the contribution of fishing to GDP, the analyst divided the sector into two principal categories and three sub-categories:

- ***Market Production.*** This category covers the fish that are caught for sale as food. The calculation assumes that the government-owned fishing company, National Fishing Corporation of Tuvalu (NAFICOT), catches 100% of the fish sold commercially. The value-added ratio of 0.55 used in the calculation is derived from NAFICOT records.
- ***Nonmarket Production.*** Nonmarket fishing includes three sub-categories:
 - (i) ***Subsistence Fishing.*** The contribution of subsistence fishing is calculated from data on household fish consumption and market prices. The data distinguish between consumption rate and price levels in Funafuti and in the outer islands.
 - *Funafuti:*
 - Average daily household consumption—1.34 kg
 - Market price—A\$2.20 per kg
 - Value-added ratio—0.85
 - *Outer islands:*
 - Average daily household consumption—1.14 kg
 - Market price—A\$1.50 per kg
 - Value-added ratio—0.90

- (ii) *Marine Products*. Marine products include a range of items taken for subsistence and used to produce handicrafts. The calculation assumes that marine products add the equivalent of 10% of the sum of the contribution of *market* and *subsistence* to GDP.
- (iii) *Fish Curing*. Fish curing is an activity carried out in the outer islands where it is not possible to refrigerate fish. The calculation used assumes that the amount of fish cured adds the equivalent of 15% of the contribution of *subsistence* to GDP.

Comments on the GDP Calculation

The calculation of the value added by *market production* uses the accounts of NAFICOT to provide values of gross output. There is very little information available on the quantity of fish caught within Tuvalu. NAFICOT has information on fish caught from its own fishing activities, but this does not include the quantity of fish caught by private fishers for commercial purposes. The value-added ratio of 0.55 may be appropriate for the NAFICOT operation, but it seems low for other private fishers, many of whom use hand lines off the reef edge. In the circumstances, it seems likely that the estimate of value added by market production is an underestimate of the contribution to GDP.

The method used to calculate the contribution of *subsistence* is reasonable given the data available. It relies upon the assumption that households in Tuvalu consume the same amount of fish every year and that the estimates in the HIES are accurate. The consultants have adopted the figures used.

The *marine products* subsector includes oysters, seaweed, crabs, lobsters, and seashells. Although the documentation does not specify this, it is assumed that this subsector accounts for all the nonfinfish taken by subsistence fishing. The empirical basis for the 10% additional value added is not specified. Since these products normally constitute part of the fish catch, they are probably better treated as part of overall subsistence fishing production.

Fish curing is carried out in the outer islands where the people do not have access to refrigeration. As with marine products, the empirical basis for the 15% additional value added is not specified. A conventional production approach would calculate the value

added by deducting the cost of intermediate consumption from the farm gate or market price of the cured product. Some data are available from a report prepared in 1996 (SCP 1997), which indicates that the breakeven input cost of fish is close to the market price for fresh fish. Given this apparent price relationship and the fact that fish curing in Tuvalu is fundamentally a food security measure, it is reasonable to treat the fish curing as part of overall subsistence. Calculating the value added by fish curing would require more detailed information on the market price for cured fish and the volume produced.

There is no provision in the accounts for nongovernment commercial fishing. While small in context of the overall level of fishing activity, private fishing is significant and should be included in the estimate of fishing contribution to GDP.

Revised Estimates of GDP

Market production:

$$220 \text{ mt} * \text{A\$2,000} * 0.65 = \text{A\$286,000}$$

Source of data: Production and price information as per Appendix 2. Includes private fishing. The market price used is a weighted average of the Funafuti price (0.70 * A\$2.20/kg) and the outer island price (0.30 * A\$1.50/kg). It assumes that 70% of the market production is sold on Funafuti. The value-added ratio is a weighted average of the NAFICOT value-added ratio used in the official calculations (0.55 * (54 mt/220 mt)) and the value-added ratio for private fishers assumed by the consultants (0.75 * (166 mt/220 mt)).

Nonmarket production:

- Subsistence

$$880 \text{ mt} * \text{A\$1,640} * 0.88 = \text{A\$1,270,016}$$

Source of data: Production as per Appendix 2. The price used is a weighted average of the Funafuti price (0.40 * A\$2.00/kg) and the outer island price (0.60 * A\$1.40/kg) weighted by the production in Funafuti and the outer islands. The value-added ratio of 0.88 is also a weighted average of the Funafuti value-added (0.40 * 0.85) and the outer islands (0.60 * 0.90). It assumes that most of the subsistence catch is taken by a mix of gleaning and diving, with some being taken from motorized boats (with motorized boats being more commonly used in Funafuti).

This can be summarized and compared to the official estimate:

Table A1.28: Official vs. Re-estimates of GDP and Fishing Contribution of Tuvalu, 1998 (A\$)

Item	Official GDP Estimate	Consultants Revised GDP Estimate
GDP (current market prices)	22,044,500	22,108,500
Fishing Contribution to GDP	1,492,200	1,556,016

A\$ = Australian dollar; GDP = gross domestic product.
Sources: Lewington (1999a); Consultants' estimates.

Vanuatu

The Nominal Contribution of Fishing to GDP

Table A1.29: Official GDP and Fishing Contribution of Vanuatu, 1995–1999 (vt million)

Item	1995	1996	1997	1998	1999
GDP (current market prices)	25,550	26,711	27,565	29,289	29,206
Commercial Fishing	149	114	57	37	34
Subsistence Fishing	216	238	265	239	244
Fishing Contribution to GDP					
By Value	365	352	322	276	278
By Share (%)	1.4	1.3	1.2	0.9	1.0

GDP = gross domestic product; mn = million; Vt = vatu.
Sources: Ministry of Finance (2000); P. Toa, personal communication, June/August 2001.

The consultants estimate that the fishing contribution to GDP in 1999 was about Vt664 million. The consultants' estimate more than doubles the official estimate.

Background

The Ministry of Finance prepares the official GDP estimates for Vanuatu. The most recent published estimates are for 1999.

The availability of detailed and current macroeconomic data is one of the outcomes of the Comprehensive Reform Program (CRP) funded by ADB. The Ministry of Finance is legally obliged to prepare a detailed macroeconomic assessment and outlook every 6 months. This assessment must include reasonably current data (BoH 2000a).

Methods used to Calculate Contribution to GDP

The contribution of *commercial fishing* to GDP is reported as part of the “Other Commercial Agriculture” subsector of the “Agriculture, Fishing and Forestry” sector. The contribution of *subsistence fishing* is included in the “Subsistence Agriculture” sector. The Ministry of Finance has calculated the respective contributions of the fishing activities as being: for commercial fishing, Vt34 million; and for subsistence fishing, Vt244 million.

- **Commercial Fishing.** This category covers the fish that are caught for sale. The method used is not known.
- **Subsistence Fishing.** This category covers fishing for home consumption. According to the Ministry of Finance, the subsistence fishing contribution to GDP was established during an agriculture census in the 1980s.⁴ This amount has been extrapolated each year for the following 17 years. The extrapolation is based on an index, which takes account of both population and prices of seafood. For the years 1995 to 1999, the indices are:

	<u>1995</u>	<u>1996</u>	<u>1997</u>	<u>1998</u>	<u>1999</u>
Index	1.71	1.84	2.00	1.77	1.77

Comments on the GDP Calculation

Given the absence of information on the method used to calculate the *commercial fishing* contribution, it is not possible to comment on the appropriateness, or otherwise, of the method.

The estimate of the contribution of *subsistence fishing* is based on a survey that is now over 18 years old. While it may have provided

⁴ Statistics Office, Ministry of Finance (1994) states that the 1983 agriculture census estimated that the production of the “village fishing sector” was 2,403 mt per year.

a reasonable estimate at the time, its contemporary accuracy is questionable. While imputing value added from household consumption data is a reasonable method, it is important that the base data be regularly updated if confidence in the results is to be maintained.

Revised Estimates of GDP

Commercial fishing:

$$880 \text{ mt} * \text{Vt}383/\text{kg} * 0.60 = \text{Vt}202,224,000$$

Source of data: Production and price information as per Appendix 2. Production and price estimates are derived from selected recent fisheries literature.

Subsistence fishing:

$$2,700 \text{ mt} * \text{Vt}190/\text{kg} * 0.90 = \text{Vt}461,700,000$$

Source of data: Production and price information as per Appendix 2. Price reflects the species mix taken by the subsistence fishers. In general, the higher value species are collected for commercial purposes, hence the lower imputed price for the subsistence catch. The production estimate is derived from selected recent fisheries literature.

This can be summarized and compared to the official estimate:

Table A1.30: Official vs. Re-estimates of GDP and Fishing Contribution of Vanuatu, 1999 (Vt million)

Item	Official GDP Estimate	Consultants Revised GDP Estimate
GDP (current market prices)	29,206	29,592
Fishing Contribution to GDP	278	664

GDP = gross domestic product; mn = million; Vt = vatu.
Sources: Ministry of Finance (2000); Consultants' estimates.