

The Contribution of Fisheries to the Economies of Pacific Island Countries

A report prepared for the
Asian Development Bank,
the Forum Fisheries Agency,
and the World Bank

Robert Gillett and Chris Lightfoot
December 2001

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Foreword

Fish, fishing, and fisheries—the various products, the trade, and the industry—all benefit the people and economies of the Pacific in a variety of ways, but the full value of these benefits is not reflected in the region’s statistics.

Records may be maintained, but they are not complete, or accurate, or comparable. The research summarized in this report reaffirms the importance of this sector to the economies and societies of the Pacific Island countries. The research reveals that the full value of fisheries is likely to have eluded statisticians, and therefore fisheries authorities, government decision makers, and funding agencies. But the value of fisheries has never escaped the fisher, fish trader, and fish processor. The difference in appreciation, between public and private individuals, must raise the question of whether fisheries are receiving adequate attention from the public sector—including the necessary management and protection, appropriate research, development, extension and training, and sufficient investment.

ADB will distribute this report as widely as possible to public sector fisheries management agencies, planning agencies, statistics offices, and to other interested parties. But it is my hope that this publication will be updated soon, in recognition of this sector’s contribution to the economies of the region. ADB will continue to work with the Forum Fisheries Agency, the Secretariat of the Pacific Community, and the World Bank in our efforts to give the fisheries sector the priority it deserves.



Jeremy H. Hovland
Director General
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Abbreviations

ADB	Asian Development Bank
AusAID	Australian Agency for International Development
BoH	Bank of Hawaii
CBSI	Central Bank of the Solomon Islands
CIF	cost, insurance, freight
CITES	Convention on the International Trade of Endangered Species
CPI	consumer price index
CRP	Comprehensive Reform Program (of Vanuatu)
DFMR	Department of Fisheries and Marine Resources
DWFN	Distant Water Fishing Nation
EEZ	exclusive economic zone
EMPAT	Economic Management and Policy Advisory Team (of the Federated States of Micronesia)
ESCAP	Economic and Social Commission for Asia and the Pacific
FAO	Food and Agriculture Organization (of the United Nations)
FFA	Forum Fisheries Agency
FOB	free on board
FSM	Federated States of Micronesia
FY	fiscal year
GDP	gross domestic product
GNI	gross national income (formerly, GNP)
GNP	gross national product
HACCP	Hazard Analysis at Critical Control Points
HIES	household income and expenditure survey
hp	horsepower
IMF	International Monetary Fund
IMM	Integrated Marine Management Limited
ISIC	International Standard Industrial Classification of All Industrial Activities
JICA	Japan International Cooperation Agency
kg	kilogram
MFA	Micronesian Fisheries Authority (formerly MMA)
MIMRA	Marshall Islands Marine Resources Authority

MMA	Micronesian Maritime Authority
mt	metric ton
NAFICOT	National Fishing Corporation of Tuvalu
NEPO	National Economic Planning Office
NFA	National Fisheries Authority (of Papua New Guinea)
NFMRA	Nauru Fisheries and Marine Resources Authority
NSO	National Statistics Office
OFCF	Overseas Fisheries Cooperation Foundation (of Japan)
PCS	Palau Conservation Society
PNG	Papua New Guinea
RMI	Republic of the Marshall Islands
SAM	Social Accounting Matrix (of the Federated States of Micronesia)
SNA	System of National Accounts
SPC	Secretariat of the Pacific Community (formerly, South Pacific Commission)
TML	Te Mautari Limited
UN	United Nations
UNDP	United Nations Development Programme
US	United States
VAT	value-added tax

Executive Summary

The study

In early 2001, Asian Development Bank (ADB) expressed a growing concern that the importance of fisheries to Pacific Island economies was not fully appreciated by the countries of the region or by the donor community. In discussions with Forum Fisheries Agency (FFA) and the Secretariat of the Pacific Community (SPC), ADB developed a concept for a study to improve the accuracy of the estimates of the contribution of fisheries to national economies. The World Bank agreed later to participate in this joint activity.

The objectives of the study

The immediate objective of the study was to use available data to measure the economic contribution of fisheries to the economies of Pacific Island nations. It was recognized, however, that a thorough quantification of the economic benefits of fisheries would require more than a short intervention. Accordingly, the longer-term objectives of the study were set as follows:

- To improve the accuracy of measuring the contribution of fisheries to national economies;
- To generate interest among government fisheries agencies in measuring the economic contribution of fisheries to national economies; and
- To provide information that could eventually be used to quantify the benefits of the various fisheries management options.

The target audience

The primary target audiences of this study are Pacific Island fisheries agency staff interested in economics and statistics agency staff interested in fisheries. In addition, the study is also intended for economists and national accountants working in the Pacific

Island region, and regional and international organizations with a general interest on fisheries in the Pacific.

The scope of the study

It was decided that the study should initially focus on the fishing contribution to gross domestic product (GDP), including examining the methods used by national authorities to calculate this contribution, commenting on the validity of these methods, and producing an independent estimation of the fishing contribution to GDP. The study also compiled information on the specific economic benefits of fisheries, including contributions to employment, exports, government revenue, and nutrition.

National accounts and GDP

National accounts are an accounting framework used to measure economic activity in a country. Most of the countries in the Pacific publish national accounts. The method used in each country is based on a standardized System of National Accounts (SNA) that was originally introduced by the United Nations in 1953. Typically, governments, international agencies and private corporations use national accounts to monitor developments within an economy. In particular, they are used to:

- Monitor changes in economic activity;
- Make cross-country comparisons;
- Prepare time-series analysis;
- Identify functional relationships;
- Determine aid eligibility/requirements.

National accounts provide several measures of activity, and the two indicators that are most commonly quoted are GDP and gross national income (GNI)—previously known as gross national product (GNP). GDP measures the level of domestic economic activity, or the economic activity that takes place within a country during a specified period of time. GNI is the measure of national economic activity, which includes domestic activity (GDP) plus the net return to the country from overseas investments and remittances.

Approaches to compiling national accounts

Three different methods are used to compile the national accounts of a country: the production approach, the income approach, and the expenditure approach.

- The **production approach** views the economy from the perspective of production. The approach measures the gross output of each producer then deducts the value of the goods and services purchased from other producers and used in the production process.
- The **income approach** measures the major components of value-added: employee compensation (wages and other remuneration), operating surplus (company profits), and indirect taxes net of subsidies. The sum of these components is the value-added to GDP.
- The **expenditure approach** is based on the final use of the output produced. It sums the expenditures of the main participants in the economy: government final consumption, private final consumption, gross capital formation, and net exports.

Valuation of subsistence production

An important aspect of the production approach is the calculation of the value of production. This can be particularly difficult when it is necessary to estimate the value of subsistence production. While there are several methods that could be used to value subsistence production in this report, “farm gate” pricing has been used. This method uses the market price of the product less the cost of getting that product to market.

Categorizing fishing activity for national account compilation

The compilers of national accounts must strike a balance between their desire for accuracy and the limitations on the time and effort they can dedicate to collecting and analyzing data. In the case of fishing, striking this balance means that they are usually limited to using generalized estimates of income or production. The

minimum level of aggregation to be used in the Pacific Islands should divide fishing into three classes of activity: large-scale commercial fishing, small-scale commercial fishing, and subsistence fishing. Each of these three categories can be analyzed using the approach most appropriate for the particular category.

Value-added ratio

The production approach to estimating the contribution of fishing to GDP requires two basic sets of data: (i) value of gross output of fishing, and (ii) intermediate costs. It is usually convenient to express the intermediate costs as a proportion of the gross output. This ratio is called the value-added ratio. In this report the value-added ratios used range from 40% for some offshore fishing to 90% for nonmotorized subsistence fishing.

Official data on the contribution of fishing to GDP

According to current official data in Pacific Island countries, the percentage contribution of fishing to GDP in 1999 (or latest prior year available) ranges from 0.6% in Papua New Guinea (PNG) to 12.0% in Kiribati.

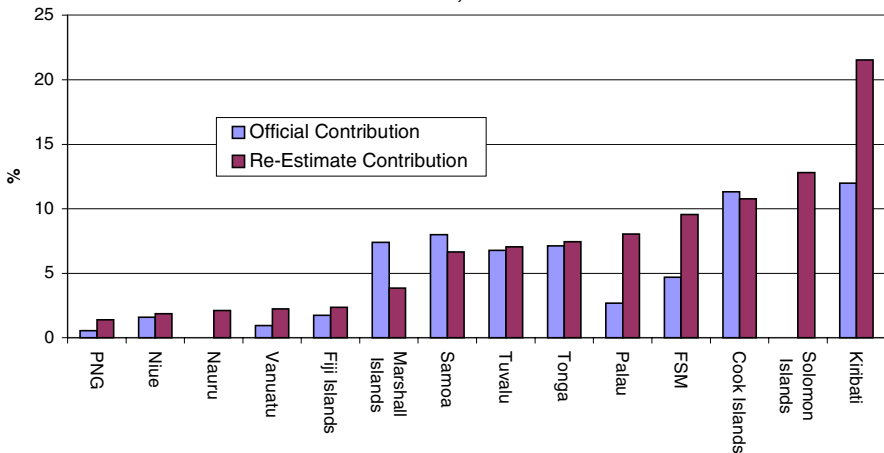
Re-estimation of the contribution of fishing to GDP

Given the complexity of the issues to be addressed and the large difference in the accuracy of the official fishing estimates made in the Pacific Island countries, it was important for the study to re-estimate the fishing contribution to GDP using a consistent method across all countries. It was believed that, at the very least, these 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 national accounting.

Comparison of official and re-estimates

The comparison between the official and the new estimates of fishing contribution to GDP is presented on Figure 1 below. The largest difference was found in Kiribati, Palau and Federated States of Micronesia (FSM), where the new estimates nearly doubled or tripled the official figures. By contrast, this study lowered the estimate of fishing contribution to GDP in Marshall Islands, Samoa and, to a lesser extent, Cook Islands. On average, the new estimates indicated a higher contribution of fishing to GDPs than reported by national statistics (7.0% vs. 5.4% across all countries).

Figure 1: Comparison of Official and New Estimates of Fishing Contribution to the GDP of Pacific Island Countries, 1999



Major reasons for difference in estimates of fishing contribution

In some countries, notably FSM and PNG, the difference in estimates is primarily due to subsistence fishing not being included in the official figures. In other countries, in particular Palau, the differences are primarily due to the methods used. For most countries, it is

a combination of differences in the estimate of production and the method used to calculate the GDP contribution. In Samoa, for example, subsistence production was valued at the full market value, rather than at “farm gate” prices. Cook Islands, Niue, Tonga, and Tuvalu all compile soundly based national accounts that include reasonable estimates of fishing contribution. Nauru and the Solomon Islands have weaknesses in compiling national accounts.

Common difficulties associated with calculating the contribution of fishing to GDP

The common difficulties found in estimating the contribution of fishing to GDP in many Pacific Island countries include:

- *Fisheries technical input.* There is a lack of coordination between fisheries agencies and statistical agencies in the calculation of fishing input.
- *Treatment of subsistence fisheries.* There is often a lack of data on subsistence fisheries and difficulties in isolating fishing from other subsistence activities.
- *Fish processing.* Because in the SNA scheme the processing of fish is outside the “fishing” sector, it is often not possible to isolate the contribution of this important fishing-related activity from other forms of food processing.
- *Export data.* Official export figures in the Pacific Island countries characteristically undervalue exported commodities, especially fisheries products.
- *Economics of small-scale fisheries.* Data on small-scale fisheries are often scarce, as is technical assistance for its analysis.
- *Lack of “champions”.* There is often a scarcity of individuals in Pacific Island countries who are vocal at stressing the importance of the fisheries sector, contributing to its undervaluation in national statistics.

Fishery production in specific Pacific Island countries

Figure 2 and Figure 3 show the estimated fisheries production and annual value in Pacific Island countries.

Figure 2: Estimated Annual Fisheries Production of Pacific Island Countries by Volume, late 1990s

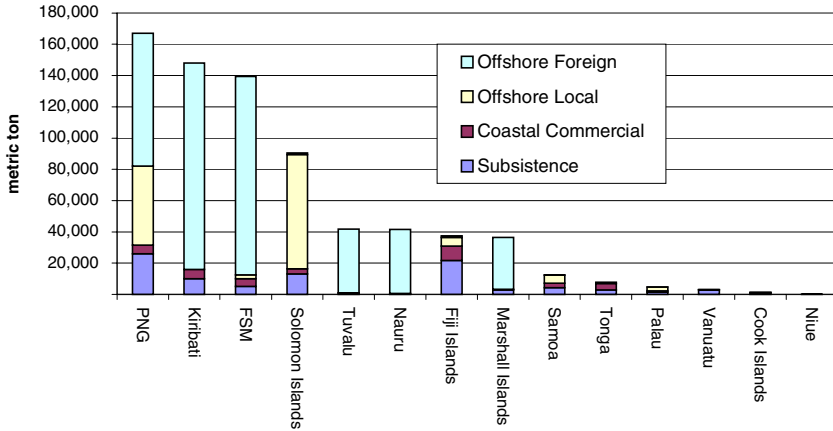
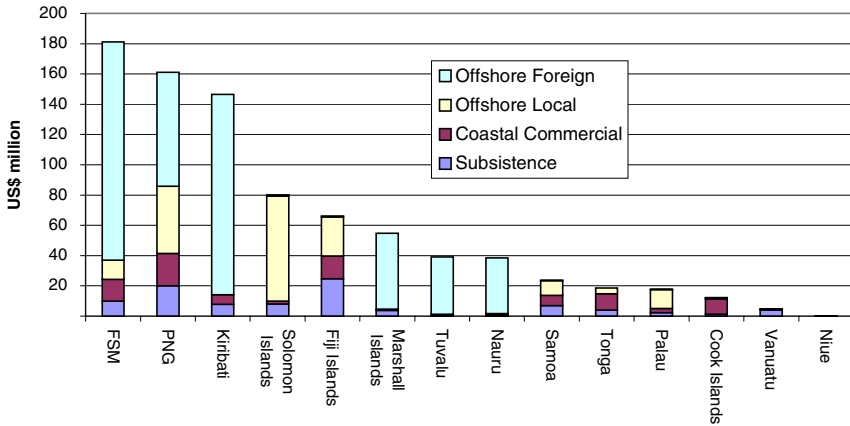


Figure 3: Estimated Annual Fisheries Production of Pacific Island Countries by Value, late 1990s



Fishery production patterns

Key patterns in the fisheries production data include :

- The weighted average price per kg in the region is US\$1.04 for subsistence fisheries, US\$2.41 for coastal commercial fisheries, US\$1.28 for locally-based offshore fisheries, and US\$1.04 for foreign-based offshore fisheries.

- The ranking of countries by total fisheries production is strongly influenced by the level of tuna catches.
- There is a general pattern of total national catches decreasing going from west to east across the region, and from equatorial to higher latitudes.
- The higher value of longline tuna relative to purse seine tuna is apparent from the ranking of the FSM where a relatively large proportion of the catch is taken by longline vessels. The FSM ranks third by volume and first by value.
- The Fiji Islands appears to have the largest non-tuna production, in terms of both volume and value.
- The production from Nauru and Tuvalu is almost entirely related to tuna fishing.

Fisheries-related employment

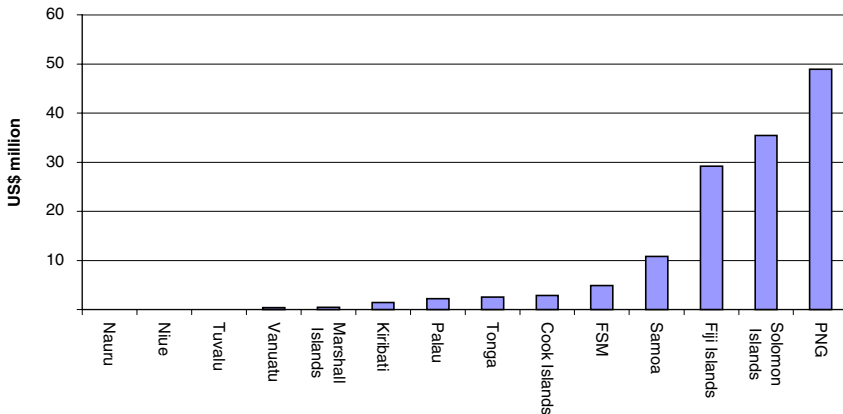
There are also certain observations that can be made about employment in the fisheries sector:

- The importance of fisheries in the subsistence economy seems to be strongly related to the type of island. In decreasing importance, atolls, islands, and large high islands are associated with very different levels of significance. This pattern is somewhat altered by PNG with its important freshwater subsistence fisheries.
- The importance of formal employment in fisheries seems to be related more to business conditions than to island type. Most formal employment in fisheries appears to be tuna-related.
- The importance of women employment in fisheries is generally understated due to (i) the practice of classifying activity according to a person's "main unpaid activity," which masks the importance of secondary activities—e.g. for many women, childcare is often the "main unpaid activity" so any fishing activity, even if it is a substantial amount of activity, is not duly reported; and (ii) placing commercial fish processing (where many women are employed) in the manufacturing sector. Where commercial fish processing occurs (canning, loining) and when this is attributed to the fisheries sector, the increase in fisheries employment is remarkable.

Fisheries exports

The most notable feature of fishery trade data in the Pacific Islands is the underestimation of the value of fisheries exports. This underestimation appears large and is probably worse than in other trade sectors. In most cases, when the official export values are compared to other sources of similar information, the differences are remarkable. Figure 4 provides estimates of fisheries exports for end-1990.

Figure 4: Estimated Values of Fisheries Exports of Pacific Island Countries, late 1990s



Features of the fisheries import and export data

Some of the key features of fisheries trade in the region include:

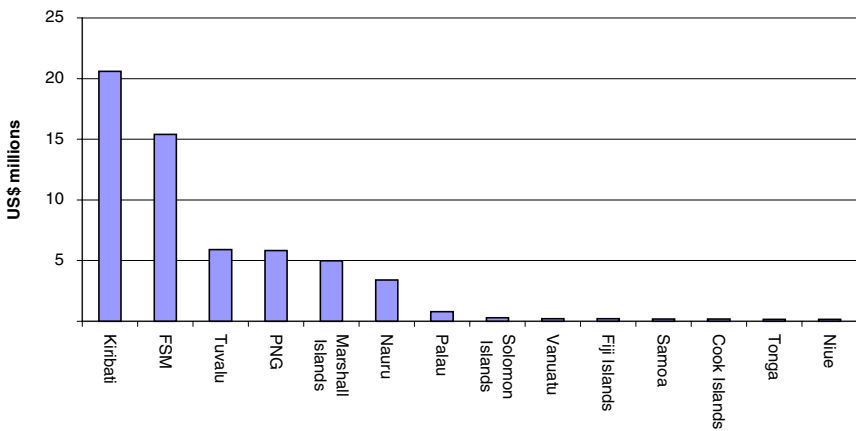
- In general terms, the region exports tuna and other high-value species such as trochus and beche-de-mer, while importing canned and inexpensive frozen fish.
- Tuna products dominate the fisheries exports of the region. For the five main exporting countries, tuna (fresh, frozen, and processed) overshadows all other fisheries exports.
- Canned mackerel dominates the fisheries imports.

- The relatively new aquarium fish industry is responsible for a significant portion of fisheries exports. Aquarium fish exports from Kiribati and the Marshall Islands now account for 78% and 95% of all fishery exports from those countries, respectively.
- There is considerable inter-annual variation in fisheries exports.
- The amount of fishery products exported as passenger baggage is quite large, especially in FSM, Marshall Islands, Palau, and Samoa.

Access fees

All Pacific Island countries received fees for foreign fishing activity in their waters. In some countries, the access fees form a very large portion of government revenue. In the FSM, for example, the 1999 access fees represented an estimated 39% of nontax revenue and 22% of total domestic revenue. In Kiribati, 34% of government income in 1999 was derived from fishing license fees. Figure 5 summarizes the value of access fees received by the different Pacific Island countries in 1999.

Figure 5: Estimated Access Fees from Foreign Fishing Vessels, 1999



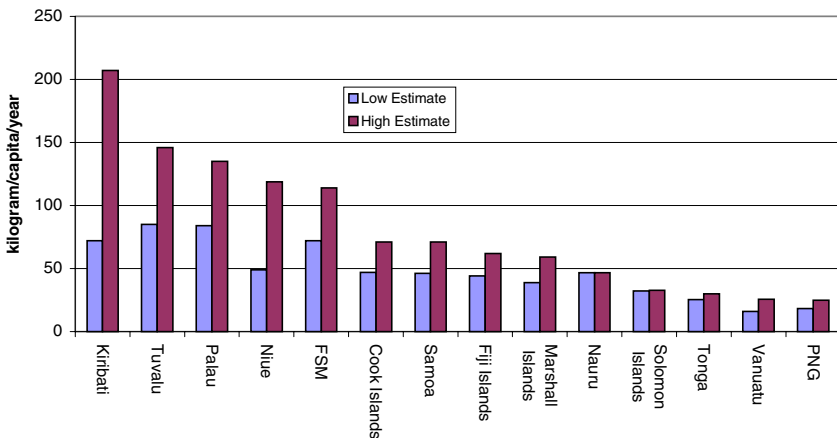
Fish consumption

Key features of fishery product consumption in the region include:

- In general, countries made up of predominantly small islands have high fish consumption rates, while large island countries have low consumption rates. The exceptions to this are Tonga where the data suggest surprisingly low fish consumption rates, and Palau where fish consumption is remarkably high.
- Most of the Pacific Island countries exceed by a large margin the world average per capita fishery product consumption rate of 13.0 kg.
- Most estimates for Kiribati indicate that it has the highest rate of fish consumption in the world.

The estimates of per capita consumption are summarized in Figure 6.

Figure 6: Ranges in Annual Per Capita Fisheries Consumption of Pacific Island Countries in the 1990s



Major conclusions and recommendations

A major conclusion of the present study is that fisheries contribution to GDP is underestimated in most Pacific Island countries.

In countries where estimates of fishing contribution to GDP are markedly different from estimates made in this study, the process used in preparing the national accounts tends to rely on dated surveys, weak indicators, and/or poorly understood methods. It is recommended that, in these countries, the compilers of national accounts carefully examine and evaluate the data, the assumptions, and the methods used.

The accuracy of the estimate of fishing contribution to GDP could be improved with a closer liaison between the fisheries and the statistics agencies. The fisheries agencies are in a position to provide information on new developments, technical insight, and recent data, all of which could improve GDP estimates. This cooperation, however, rarely occurs in Pacific Island countries. Because the fisheries agencies have a vested interest in assuring that the importance of their sector is not underestimated, they should take the lead in improving the liaison between their agency and the compilers of national accounts.

One of the factors that often result in an underestimation of fisheries contribution to national economies is the limited information available on the production of small-scale fisheries. Throughout most of the region, the statistics on small-scale fisheries are incomplete, inaccurate and, in some cases, absent. Given this reality, it is recommended that maximum use be made of survey opportunities *outside* the fisheries sector. At little cost, production information on small-scale fisheries could be collected through such tools as the national census, nutrition surveys, agriculture censuses, household income and expenditure surveys (HIES), and poverty studies.

In many countries, the underestimation of the value of fisheries exports in official customs statistics is a major source of error in the calculation of fisheries contribution to national economies. It appears that the export information could be worse in fisheries than in most other sectors. In countries where this problem is especially acute, it is recommended that export valuation be based on a broader spectrum of information than what is provided by customs.

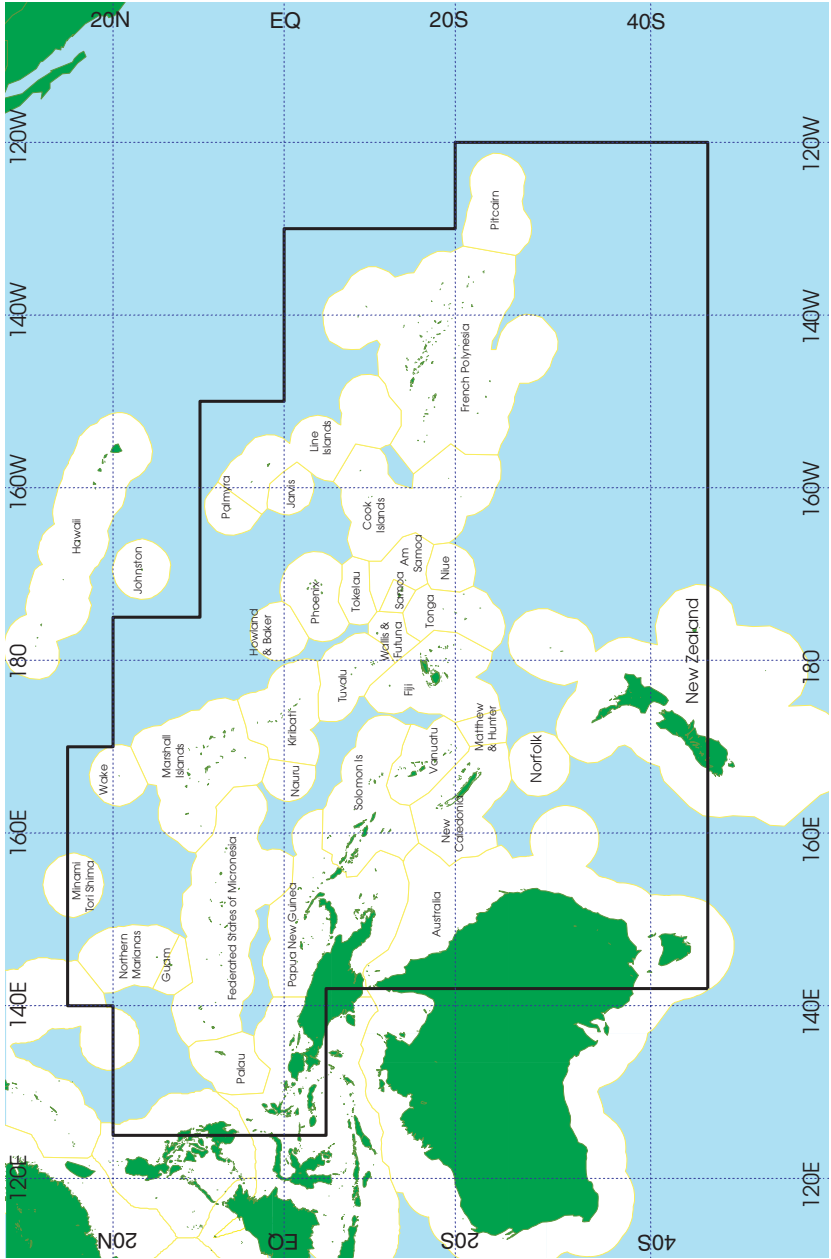
Additional information on the economics of small-scale fisheries would contribute to improving measurement of the fisheries

contribution to GDP. Studies to gather the required data need not be complex but should cover the major small-scale commercial and subsistence fisheries.

Where the compilers of national accounts have access to comprehensive and detailed information on the income/expenditure of the participants in one or more sectors of the fishing industry, the income approach is the most appropriate method of calculating the fishing contribution to GDP. In the Pacific, it is, however, rare for this data to be available. In these circumstances, the production approach is likely to produce the most accurate results.

Regional organizations could play an important role in improving the measurement of fisheries in the economies of their member countries.

Figure 7: The Pacific Islands Region



Source: Secretariat of the Pacific Community (SPC). The dark line delimits the SPC fisheries statistical area.

Introduction

In early 2001, Asian Development Bank (ADB) expressed the growing concern that the importance of fisheries to Pacific Island economies is not fully appreciated by the countries of the region nor by the donor community. In discussions with Forum Fisheries Agency (FFA) and the Secretariat of the Pacific Community (SPC), ADB developed a concept for a project to improve the accuracy of the estimates of the contribution of fisheries to national economies. At a later stage, World Bank agreed to participate in this joint activity.

The partners in this activity established that the immediate objective of the project would be to measure the economic contribution of fisheries to the economies of Pacific Island nations from available data. It was recognized that a thorough quantification of the economic benefits of fisheries would require more than a short intervention. Accordingly, longer-term objectives were set as follows:

- (i) To help improve the accuracy of measuring the contribution of fisheries to national economies;
- (ii) To generate interest among government fisheries agencies in measuring the economic contribution of fisheries to their national economies;
- (iii) To provide information which could eventually be used to quantify the benefits of the various fisheries management options.

It was decided that the project should initially focus on the fisheries contribution to gross domestic product (GDP), including examining the methods used by national authorities in the calculation of this contribution, commenting on the validity of these methods, and producing an independent estimation of the fishing contribution to GDP. A need was also recognized for a compilation of information on the specific economic benefits of fisheries, including contributions to employment, exports, government revenue, and nutrition.

To implement the project, two consultants were recruited: (i) a fisheries specialist was contracted by ADB, and (ii) a macroeconomist was contracted by World Bank. The information used in compiling this report was collected from May to September 2001. Short visits of 1–2 days for data collection were made by the fisheries specialist

to Marshall Islands, Federated States of Micronesia (FSM), Samoa, Solomon Islands, and Tonga. More time was available to obtain information in the Fiji Islands, the home base of one of the consultants. Cook Islands, Kiribati, Nauru, Niue, Palau, Papua New Guinea (PNG), Tuvalu, and Vanuatu were not visited due to the constraints of time, funding, or airline schedules. Information from those countries came either from personal contact with government officials at regional meetings or from telephone and e-mail contact. In most countries, it was possible to obtain data from the staff of both the fisheries and statistics agencies. However, data coverage was substantially better in countries that were actually visited.

Although it would be desirable for the study to be as broad as to cover the full fisheries sector of the Pacific Island region, it was necessary to limit the scope of the exercise. The period covered is generally the mid- and late-1990s, with 1999 being used in several comparisons. Coverage is limited to the 14 independent Pacific Island countries. While it is recognized that freshwater fisheries are substantial in at least one of the countries, the present study is limited to marine fisheries.

National Accounts and Associated Issues

To those involved in fisheries, the importance of the industry to the economy is obvious: (i) exports of fish and fish products earn foreign exchange which helps provide the resources needed to pay for crucial imports; (ii) it provides employment for a substantial number of people; (iii) the catch of commercial and artisanal fishers provide an important source of food for the community; and (iv) the fish, shellfish, seaweed and other aquatic resources collected by families are a crucial part of their livelihood.

While the importance of fisheries is self-evident to those involved in the industry, it is far less obvious to many others. The boats that catch fish for export are often at sea or moored at wharves that are away from the public gaze; fishes are purchased in markets and retail stores where there is little to link them to the fishing industry; and the collection of marine and other aquatic products for home consumption is often taken for granted.

Of itself, this lack of awareness need not be a problem. It is not necessary for everyone to fully appreciate the significance of any activity in the economy. However, when that lack of appreciation extends to policymakers, planners, and development agencies, it can mean that fisheries development receives a lower priority than it deserves. One of the keys to ensuring that the fisheries sector receives the level of support warranted is to make certain that the sector's contribution to the economy is accurately portrayed in a country's national accounts.

National Accounts

What are they?

National accounts are an accounting framework used to measure the current economic activity in a country.¹ Most of the countries in

¹ Those readers who would like a more comprehensive description of national accounting will find it well covered in most macroeconomic textbooks. In addition, the supporting documentation to the System of National Accounts (SNA) 1993 provides a comprehensive description of the procedures and conventions used in preparing national accounts.

the Pacific publish national accounts. The method used in each country is based on a standardized System of National Accounts (SNA) that was originally introduced by the United Nations in 1953. The SNA has since been revised, refined, and was republished in 1993 (SNA 1993).

What are they used for?

Typically, governments, international agencies, and private corporations use national accounts to monitor developments within an economy. In particular, they are used to:

- (i) Monitor changes in economic activity;
- (ii) Make cross-country comparisons;
- (iii) Prepare time-series analysis;
- (iv) Identify functional relationships; and
- (v) Determine aid eligibility/requirements.

National accounts are compiled for a succession of time periods, thus providing a continuing flow of information that is indispensable for the monitoring, analysis and evaluation of the performance of an economy and its components over time. They usually provide information not only about economic activities but also about the levels of an economy's productive assets and the wealth of its inhabitants at particular points of time.

In practice, while the methods used to construct national accounts are based upon a standardized system, there are different approaches that can be used and the quality of the data available can vary significantly. There may be substantial differences in the methods used by each country, so care should be exercised when making cross-country comparisons. In a few cases, the methods used within a country have changed; hence, inter-temporal comparisons for those countries should also be approached with caution.

What do they show?

While national accounts provide several measures of activity, the two indicators that are most commonly quoted are **GDP** and **gross national income (GNI)**.² GDP measures the level of domestic

² Prior to the 1993 revision of the System of National Accounts, Gross National Income was known as Gross National Product (GNP).

economic activity—i.e., economic activity that took place within a country during a specified period of time. GNI is the measure of national economic activity, which includes domestic activity (GDP) plus the net return to the country from overseas investments and remittances. In the case of fishing, these returns from overseas include income from fishing access fees from nonresident fishing by foreign operators. This income is classified as “rental income.”

Typically, a comprehensive set of national accounts will show the contribution to GDP by each of the major sectors in the economy, plus the distribution of income and expenditure between the various classes of enterprise in the economy. For example, GDP is normally divided between major sectors including manufacturing, transport, wholesale and retail, agriculture and other primary industries, etc. Similarly, GDP can also be divided among various classes of enterprises including government, private nonprofit, corporations, etc.

It is important to note that, although a sector’s contribution to national GDP may seem small, it can be crucially important to the national economy. The country of Iceland provides a good example. Iceland’s economy is highly dependent on fish and fishing. Fishery products make up 70% of exports. Despite this importance, the fishing sector contributes only 13% to GDP. This is because many fishing-related activities are accounted for in other sectors such as manufacturing. Moreover, much of the economic activity generated by fishing, such as retail trade, is counted as value-added in other sectors.

How are national accounts constructed?

The three different approaches to computing the national accounts of a country are: *production approach*, *income approach*, and *expenditure approach*.

- The **production approach** views the economy from the perspective of production. The approach measures the gross output of each producer then deducts the value of the goods and services purchased from other producers and used in the production process.
- The **income approach** measures the major components of value-added: employee compensation (wages and other remuneration), operating surplus (company profits), and indirect taxes

net of subsidies. The sum of these components is the value-added to GDP.

- The **expenditure approach** is based on the final use of the output produced. It sums the expenditures of the main participants in the economy: government final consumption, private final consumption, gross capital formation, and net exports.

Given that all three approaches are derived from the same data, by definition, the GDP calculated by each should be identical. In practice, it is often difficult to measure everything with equal reliability. This means that there may be differences between the results generated by each approach. However, these differences are seldom significant.

Definitions and Conventions

As with any system, a set of procedures and conventions is used in compiling national accounts. The nature and application of these procedures and conventions must be taken into account when interpreting national accounts.

Productive Activity

One of the most basic issues in the preparation of national accounts is the nature of activities that are included in the estimation of domestic product. In particular, any goods or services that are produced by a resident of a country *for sale* are included. Goods and services that are for sale are known as **market production**.

Service activities that are for personal or households' *own consumption* are not included in the calculation of national accounts. For example, house cleaning is not included if carried out by the family. These goods and services are known as **nonmarket production** or **subsistence production**. However, if goods produced for own consumption could reasonably be sold, they are included in the national accounts. Subsistence fishing is an example. While the fish may have been caught for a family's own consumption, the convention assumes that the fish could have been sold and, therefore, it should be treated as adding value to the economy. Clearly, this can be a significant issue in fisheries in the Pacific Island countries where

large numbers of households rely on the harvest of aquatic resources for food and other uses.³

Goods and Services

Goods are physical products such as machinery, food, housing, and infrastructure. Services include activities like medical advice, hairdressing, policing, and consultancy.

Residency

The nature and extent of residency is a core concept of the SNA. It defines what shall be counted as domestic product. For goods and services to be included in the domestic product of a particular country, a resident of that country must produce them. A resident is an individual or enterprise whose “center of economic interest” is within the country. The “center of economic interest” is determined by the following tests:

- (i) Do residents of the country, in whose area the fishing activity occurs, get significant factor payments (i.e., wage or operating surplus) from the activity?
- (ii) Does the government of the country or the individual or the business entity located in the country, in whose area the fishing activity occurs, have a day-to-day influence on the way the fishing is carried out?
- (iii) Is the fishing based in the economic territory and/or employing local staff?
- (iv) Is the fishing an integral part of the domestic economy?

It is important to note that a resident need not be a citizen. The production of foreign nationals is treated as domestic product provided the country is the “center of economic interest” for the enterprise/individual. This concept is particularly important in the case of fishing where many of the enterprises are mobile, and it is common

³ It has been estimated that about 75% of people in the Pacific Island countries live in rural areas and that most of these households produce or collect all or some of their food and household items (*Population Statistics*, Statistical Bulletin No. 42, South Pacific Commission, 1995).

for vessels to be staffed by nationals from different countries. In effect, this means that the product of locally-based offshore foreign vessels is treated as domestic product of the country from which they are operating regardless of the nationality of the crew.

Under the SNA, the standard convention is to treat activities by a foreign operator that take place in a country for less than 12 months as being foreign activities. In the case of fishing, it is common for offshore foreign vessels to fish for only part of the year in local waters. In these circumstances, a strict interpretation of the SNA convention on "time in country" would treat these activities as foreign and only include the license fees as part of the national accounts. However, where the activities are seasonal and the main activity of the vessels is based locally, it would be more appropriate to follow the "center of economic activity" convention and count their production as domestic product.

A related issue, which is particularly important in fishing, is the geographic extent of the "center of economic interest." The SNA convention is to treat any activity as domestic provided it takes place within the "economic territory" of the country. The SNA boundary for domestic activity is not limited to the political boundary. It extends to include the "economic territory." This convention has particular importance for fishing, especially offshore fishing, which can take place a considerable distance from the land and political boundaries of a country. For example, the political boundary is usually confined to the territorial seas, which extend out to 12 miles from the high water level. In practice, most countries use their exclusive economic zone (EEZ) when defining the geographic limits of their "economic territory"; and in the circumstances, this practice is the most appropriate.

Two other "geographic" issues that must be addressed in fishing are (i) how to treat fishing activities that take place in other jurisdictions, and (ii) how to treat those that take place in international waters.

When the fishing occurs in the waters of another country, the determination of how to treat that activity in the national accounts depends upon the duration of the activity and its "center of economic activity." The SNA indicates that temporary work in a foreign country should be treated as domestic product in the home country (the center of economic activity) of the entity carrying out the job. For example, the income earned by a consultant who

normally resides in the Fiji Islands and undertakes a short-term contract in Samoa would be treated as Fiji domestic product, i.e. it is tantamount to an export (of services). SNA, Section 6.239 states:

It should be noted, however, that GDP is not intended to measure the production taking place within the geographical boundary of the economic territory. Some of the production of a resident producer may take place abroad, while some of the production taking place within the geographical boundary of the economy may be carried out by non-resident producer units. For example, a resident producer may have teams of employees working abroad temporarily on the installation, repair or servicing of equipment. This output is an export of a resident producer and the productive activity does not contribute to the GDP of the country in which it takes place. Thus, the distinction between resident and non-resident institutional units is crucial to the definition and coverage of GDP.

This being the case and in the absence of any indication to the contrary such as the formal relocation of the operation, fishing activity of less than 12 months in foreign waters should be treated as domestic product in the home country of the vessel owner/operator.

Following the same convention, fishing that takes place in international waters may be domestic product of a country provided the operation is carried out by a resident and is temporary in nature. In some circumstances, fishing carried out in international waters could become a particularly perplexing problem for the compilers of national accounts. Where a fleet operates in international waters most of the time, including transshipping and re-supply, the question of whether to allocate the production as domestic or national product becomes an issue.

It is difficult to set strict rules since each situation is different. In practice, the compilers of national accounts will make judgments about where to allocate production of fleets that occurs on the "boundaries" of countries and nationality.

Valuation

In all cases, national accounts are reported in monetary terms. Usually the local currency is used and, almost always, the accounts are presented in current market (nominal) values and constant (real) values. Current market values use the value of the currency at the

time of measurement. Constant values are indexed to the price levels of a specified year so as to remove the effects of price inflation and thereby allow the comparison of real changes over time. It is also common for the international agencies such as ADB, International Monetary Fund (IMF), United Nations (UN), and World Bank to produce national accounts using the equivalent value of a convertible currency, usually the United States dollar (US\$). This practice makes it easier to do cross-country comparisons and to track the changes in each country's international competitiveness.

An important valuation convention that is particularly relevant for fishing is the treatment of nonmarket household production (subsistence). Since by definition these items are not sold and the quantity produced is seldom recorded, it is necessary to make assumptions about their value. It is common practice to value nonmarket household production conservatively and, in some cases, production for own consumption is not even included in the national accounts.

Assets

In the SNA, assets are restricted to things that are produced by an economic activity. This distinction is particularly important for natural resources and is a contentious issue, especially in relation to the overexploitation of natural resources.

Naturally occurring assets such as marine resources, minerals, and forests do not enter the national accounts until they are being exploited and then only to the extent that they are being exploited. Unlike changes in inventories of produced assets, changes in the quantum of natural assets are not reflected in the national accounts. This convention ignores the very real impact that changes in abundance of natural assets have on the "wealth" of an economy. This can result in misleading values being reported on fisheries and other sectors that rely on natural resources. For example, the income generated from the exploitation of fish is included in the national accounts, while the changes in abundance are not. In these circumstances, the short-term gain from the overexploitation of a fish stock shows up as a positive gain for the economy. If the changes in abundance were also taken into account as happens with inventories of "produced assets," the apparent benefits for the exploitation of natural assets would be substantially reduced.

Fishing vs. Fisheries

For the purpose of clarity, it is useful to distinguish between the terms “Fishing” and “Fisheries.” “Fishing” is commonly used to describe the various activities involved in the harvest of aquatic resources, whereas “Fisheries” is usually used to describe a broader range from capture through postharvest handling, transport, processing, and marketing.

The conventions used in the SNA and those followed in this report are somewhat different. The categories of economic activities recognized by the SNA are those of the International Standard Industrial Classification of All Industrial Activities (ISIC). In this system, the category relevant to fisheries is ISIC 0500: “Fishing, operations of fish hatcheries and fish farms, service activities incidental to fishing.” It is important to note the following:

- (i) Postharvest activities, including fish processing, are not included in the fishing sector, but rather they are generally counted in manufacturing and other sectors.
- (ii) Aquaculture is included in the sector.
- (iii) Subsistence fishing is a legitimate component of the fishing category.
- (iv) For convenience, the sector is usually referred to as “fishing.”

A useful guide to the classification of an activity as “Fishing” is provided in the definitions of “fish” and “fishing” as contained in the fisheries acts of Pacific Island countries. In each case, the definitions are very similar. The following extract is taken from the Tonga Fisheries Law:

“Fish” means any aquatic animal, whether piscine or not, and includes any cetacean, mollusk, crustacean, coral (living or dead), and other coelenterates, sponge, aquatic plants, holothurian (beche-de-mer) or other echinoderm, and turtle, and their young and eggs.

“Fishing” means –

- (a) searching for, catching, taking or harvesting fish;
- (b) attempting to search for, catch, take or harvest fish;
- (c) engaging in any other activity which can reasonably be expected to result in the locating, catching, taking or harvesting of fish;

- (d) placing, searching for or recovering fish aggregating device or associated electronic equipment including radio beacons;
- (e) any operation at sea directly in support of, or in preparation for any activity described in this paragraph; or
- (f) the use of any other vehicle, air or sea borne, including aircraft or helicopter use, in relation to any activity described in this paragraph except for emergencies involving the health or safety of crew members or the safety of the vessel.

Sport Fishing/Whale Watching/Diving

As in any system that divides a continuous range of activities into discrete categories, the construction of national accounts requires some fairly arbitrary dividing line to be drawn between categories. For example, the activities (or part thereof) of sport fishing, whale watching, and sport diving involve the use and enjoyment of aquatic resources. The SNA provides little direct guidance on how these activities should be classified. Since in most cases these activities are forms of entertainment or tourism, the value-added by each activity is generally attributed to other categories in the national accounts.

Other Considerations

While it is well beyond the scope of this report to provide a comprehensive analysis of national accounting, there are a few issues that bear directly on fishing and therefore warrant some discussion. These include (i) how to measure an activity, (ii) how to calculate the value-added by an activity, (iii) the nature of the organization to be treated as an economic entity, (iv) what was the period in which the activity occurred, (v) was the activity domestic or foreign, and (vi) whether the activity was commercial or for subsistence.

Since the level of information available is usually less than perfect and occasionally nonexistent, the compilation of national accounts usually involves a number of assumptions, judgments, and estimates. In some circumstances, these assumptions and judgments may be incorrect.

It must be kept in mind that GDP is an *estimate* of economic activity; it is seldom a precise calculation. Even though the SNA sets

out fairly straightforward procedures, in practice, the analyst is usually confronted with many uncertainties. Data are often unavailable, incomplete or suspect; hence, the analyst is forced to make judgments about what data to use and how those data should be treated. Some people may find this apparent lack of rigor disturbing, but it is usually unavoidable, especially in “messy” sectors like fishing. To make matters worse, the fishing sector is often only a small part of GDP, which means that only a limited amount of the analyst’s time and effort can be expended for collecting data to update the estimate.

Typically, the sources of data an analyst would use to estimate the contribution of fishing include income and expenditure data from commercial operations, fisheries production and marketing information, and household income and expenditure data. Sometimes, secondary data like social security records, air-cargo records, international market reports, and various reports that bear on aspects of the industry might be used. The choice of which data set to use depends upon the analyst’s judgment about the accuracy of the data, its coverage, and the ease of accessing the information.

Multiplier Effects

GDP and its component parts provide an important and very useful guide to the structure of an economy, but they do not show the impact of any activity on the economy. For example, the fishing contribution to GDP is limited to the value-added to the economy by the activity of fishing, but the flow effects from the activity of fishing appear as value-added by other sectors of the economy. The difference between “contribution” and “impact” can be illustrated by considering the consequences of an increase in fishing activity. If the amount of fishing activity increases by \$1.0 million and the intermediate costs used in this activity are \$0.4 million, then GDP will increase by \$0.6 million. At the same time, the \$0.4 million spent on the intermediate costs will directly increase the level of activity elsewhere in the economy. If \$0.1 million of the \$0.4 million were spent on provisions, the contribution by the “Wholesale and Retail” sectors to GDP would increase by \$0.1 million less any intermediate costs. In addition, the \$0.6 million that has now been added to the fishing contribution to GDP is principally wages and profits, most of

which will be spent by the recipients on goods and services. This, in turn, will increase the level of activity in other sectors of the economy.

The people who benefit from the sale of goods and services from "Fishing" will in turn purchase goods and services from others, and thereby stimulate further activity. The cycle of activity thus generated by the initial production will have ripple effects throughout the economy. The aggregate impact will depend upon the extent to which the goods and services purchased are produced domestically and the proportion of their income that people spend or save. The net effect on economic activity will almost certainly be far greater than the contribution to GDP. This cycle of impact is known as the multiplier effect.

In practice, the multiplier effects can be fairly difficult to calculate. The dynamic nature of economies means that every action will be followed by a reaction. Changes in a sector will be at least partly offset by changes in the structure of the economy. This was illustrated by the response of households in Samoa to the impact of taro blight on their primary subsistence crop. Most households responded by switching their food production efforts to alternative crops, notably plantains. So while the level of economic activity committed to taro production contracted, in terms of the overall level of economic activity in the economy, this contraction was largely offset by the increase in the level of activity in plantain production. The net effect was a reduction in economic activity but by a far lesser amount than the reduction in taro production activity.

While it was beyond the scope of this study to identify the multiplier effects of fishing, it remains an important issue. In the absence of this understanding, the impact of policy changes, management strategies and investment can be seriously underestimated.

Valuing Subsistence Production

There are several methods that could be used to value subsistence production including (i) the "farm gate" pricing (used in this report), (ii) the "value of calories" produced, (iii) the "opportunity cost of labor," or (iv) the "reservation price of labor."

The "farm gate" pricing method uses the market price of the product less the cost of getting that product to market. In effect, it is saying that the value of own consumption is equivalent to the price the product could be sold for in the market less the cost of getting

the product to market. This approach implies that the volume of subsistence production would have little or no effect on the market price if it were to be marketed. Where the volume of subsistence far outweighs the volume marketed, this assumption may be too generous.

The “value of calories” approach estimates the calorific value of home consumption and the cost of purchasing those calories in alternative foods. The value of home consumption then becomes the volume of calories consumed multiplied by the cost per calorie. This approach does not adequately account for the nonfood items for own consumption. It also implies that the “quality” of own production is the same as the “quality” of purchased foods. This may not be the case, especially where a household is willing to pay a premium for purchased goods that are seen as prestige food items. If the value of production for own consumption is imputed from premium goods, it will be over-valued.

The “opportunity cost of labor” approach requires data on the amount of time spent producing the product for own consumption and the income that could be earned if the labor was used in another way. There may, however, be instances when alternative uses of labor are few, if not lacking. In such case, the “opportunity cost of labor” would be zero; hence, the implied value of own production is also zero. This is obviously not a true representation of the value of production for own consumption.

The “reservation price of labor” is a variation of the “opportunity cost of labor.” It also requires information on the time spent producing the product for own consumption. But instead of using the income that could be earned if the labor was used in another way, the “reservation price of labor” uses the minimum return that is necessary to make a person work. In effect, it is the minimum acceptable wage rate, which, it should be noted, may be considerably less than any statutory minimum wage rate. This method would probably give the best estimate of the value of subsistence production. But since the data necessary to make the calculation is seldom, if ever, available, it is rarely used.

While each of the above methods has its advantages and disadvantages, there are practical issues that determine which method is best used. In this report, the consultants have used the “farm gate” pricing method as recommended by SPC in the publication, *A Guide to Estimating the Value of Household Non-Market Production in the Pacific Island Developing Countries* (Bain 1996).

Guidelines for Calculating the Fishing Component of GDP

General

As with the estimation of any contribution to GDP, the most appropriate method to use in estimating the contribution of fishing will depend on the nature of the data and the resources available to collect and analyze these data.

The compilers of national accounts must strike a balance in their desire for accuracy and the limitations on the time and effort they can dedicate to collecting and analyzing data. In the case of fishing, striking this balance means that they are usually limited to using generalized estimates of income or production. In the consultant's opinion, the minimum level of aggregation that should be used would divide fishing into three classes of activity: (i) large-scale commercial fishing, (ii) small-scale commercial fishing, and (iii) subsistence fishing.

In the following, large-scale commercial fishing is predominantly the offshore tuna fisheries of the region. Small-scale commercial fishing includes both non-tuna exports and the fishing to supply the local markets. Subsistence fishing includes fishing for a variety of products for own consumption. In practice, the distinction between small-scale commercial fishing to supply the local market and subsistence fishing is somewhat arbitrary. The working definition used is that small-scale commercial fishing includes all activities that are predominantly for the purpose of producing fish *for sale*, whereas subsistence fishing activities are those that are predominantly done to produce products for *own consumption*.

Large-scale Commercial Fishing. This activity usually involves relatively few large vessels operated by commercial enterprises. Normally, these companies keep financial records so it should be possible to undertake an annual income/expenditure survey or, failing that, obtain information from taxation returns. If financial information is available and reliable, the income approach can be used to estimate the contribution of large-scale fishing to GDP. It is noted

that the structure and composition of these financial records are likely to vary between enterprises. In the circumstances, if the income approach is to be used, the compilers of national accounts should seek advice from people involved in the industry on how to interpret the data.

Where financial data are not available or are considered to be unreliable, a production approach could be used. If so, it is essential to identify a reliable source of production records. This may not be as straightforward as it sounds. The ideal situation is where an ongoing series is compiled from accurate data by an independent agency using a consistent method and published in a timely manner. In practice, this is a rare situation. In this report, the consultants have usually relied on data from fisheries literature. While this data partially satisfies the independence and accuracy criteria, often methods used to compile the data reported in the literature vary and the data are seldom from an ongoing series.

Although the production approach may be the most practical method to use in estimating the contribution of large-scale fishing to GDP, the compilers of national accounts should, in many cases, be aware of, and compensate for, some important weaknesses in the said approach:

- (i) *The assumption of fixed value-added ratios.* In practice, these ratios are subject to substantial variation, more so than in any industrial sectors. Major causes of this are changes in catch rates and in prices.
- (ii) *The difficulty of estimating prices.* Typically, prices for fish vary widely by fish size, species, product form, season, and market so that average price estimates derived from price data, as opposed to revenue data, can be substantially inaccurate.

These difficulties with the production approach can be at least partially compensated for by periodic surveys to “ground truth” the assumptions on value-added ratios and prices.

It is common to use official export figures to estimate the production of large-scale commercial fishing. Unfortunately, as explained in Section 7.2, the official export figures are often inaccurate. An alternative could be to use the production estimates available in various forms from SPC. Price data can be obtained from the FFA Market

Advisor. It may also be possible to use an annual informal survey of several operators but care would be needed to ensure that the information is accurate and unbiased. Given the vagaries of the markets for fish, the operating surplus will vary between years. This, in turn, will affect the size of the value-added ratio. As with the price, it should be possible to estimate the appropriate value-added ratio from an informal survey of several operators.

Small-scale Commercial Fishing. This activity usually involves a large number of participants using a variety of gears and fishing techniques. Often the participants do not keep accurate financial records and, even when they do, the time and cost of accessing those records each year would be beyond the resources of most statistics agencies. In these circumstances, the production approach is usually the most appropriate method to estimate the contribution of small-scale commercial fishing to GDP.

The difficulty facing the statisticians is finding reliable production and price data for each year. The production of small-scale commercial fishing can be broadly divided into two classes: (i) export products such as trochus, beche-de-mer, aquarium fish, etc., and (ii) food for sale on the local market.

The production and value of the export products can vary markedly between years as the supply and markets fluctuate. In the circumstances, the compilers of national accounts have little choice but to obtain new data each year. In some cases, these data are available from the local fisheries agency. Where the fisheries agency is unable to provide the data, the analysts will need to collect them from the exporters or from shipping agents.

In the absence of up-to-date fishery surveys, it should be possible to extrapolate the value of fish produced for domestic consumption from data obtained in household income and expenditure surveys (HIES), agricultural censuses, and other such sources. This, however, relies on the presumption that the HIES and other such surveys collect data on fish consumption and/or production, something that is not always the case. Where the data include per capita or household consumption estimates, it is possible to extrapolate the data using changes in the population and thereby impute the production. It is likely that prices will remain fairly constant, at least in real terms, so occasional market surveys or data in HIES can be indexed to the consumer prices to estimate the value of production.

Similarly, the value-added ratios are unlikely to change substantially over time so the data from occasional surveys on the economics of small-scale fishing could be used to derive these ratios.

Subsistence Fishing. Most rural households in the region do at least some subsistence fishing. The techniques used, the time spent, and the contribution the catch makes to the livelihood of the people vary considerably.

There are several techniques that can be used to impute subsistence production, but most rely on some measure of household consumption of food and/or fish. The most common approach is to use data on consumption, expenditure and/or activity from an HIES as a base, then compute annual production by using changes in population to extrapolate the base data.

One of the risks pointed out earlier in this report is the possibility of double-counting subsistence fishing and small-scale commercial fishing. Care must be taken to ensure that the value of fishery products purchased by households from the small-scale commercial fishers are deducted from the total consumption when estimating the level of subsistence production.

Value-added Ratios

The production approach to estimating the contribution to GDP requires two basic sets of data: (i) value of gross output of fishing, and (ii) intermediate costs.

It is usually convenient to express the intermediate costs as a proportion of the gross output. For example, in the case of small-scale fishing using motorized boats, the fuel, bait, provisions, and maintenance are all intermediate costs. If the total value of the catch is \$1,000 and the sum of the intermediate costs is \$400, then the proportion of the gross output attributable to intermediate costs is 40%. Therefore, the value-added by small-scale fishing using motorized boats is $\$1,000 * (1-0.40) = \600 . In this example, the intermediate cost ratio is 0.40 and its reciprocal, 0.60, is the value-added ratio. It should be noted that the intermediate costs refer to operating expenses. Expenditures on large capital items, such as engines, are capital expenditures and are thus not counted as intermediate costs.

In practice, each operator is likely to have a different value-added ratio. However, in the preparation of national accounts, it is

usually not possible to individually measure each operation. The normal practice is to estimate an *average* value-added ratio for each type of activity for each country. In this report, value-added ratios have been estimated for each of the main categories of fishing that are used in the region: (i) large-scale offshore fishing, (ii) small-scale commercial fishing, and (iii) subsistence fishing. In addition, there are various types of specialty fishing—including aquarium fish and related products, diving, seaweed culture and collection, and pearl cultivation—each of which has its own value-added ratio.

Calculating Value-added Ratios

Large-scale Offshore Fishing. All the enterprises involved in this sector are of large-sale commercial operations. Of necessity, these enterprises keep records of their income and expenditure from which it is possible to calculate a value-added ratio. It should be noted that if income and expenditure data are available for every enterprise in the sector, an income approach to calculating the value-added ratio would normally be used. However, when this is not the case, analysts must resort to using a production approach based on overall production from large-scale fishing and price data. In these circumstances, a sample of the income expenditure of one or more typical enterprises can be used to calculate the value-added ratio for the sector.

Small-scale Commercial Fishing. This sector is usually more diverse than large-scale commercial operations. There is often a marked difference in the type of vessel used by each enterprise. Typically, the vessel used could be specially designed fishing boats with inboard motors, outboard skiffs, and canoes. The cost of operating each type of vessel differs and, hence, the value-added ratio of the related activity also differs. Some enterprises may keep income and expenditure records, but many do not. Also, it is often difficult to split the sector catch between each class of activity. In the circumstances, the analyst usually must resort to using a generalized estimate of value-added ratios based upon information about the composition of the fleet. Information from which to estimate the value-added ratios for small-scale fishing may be available from (i) the records of development banks and other financial institutions, (ii) surveying the sector, (iii) published reports on the sector including studies into the benefit/cost of proposed development projects, and (iv) anecdotal

information from discussions with people involved in the sector.

Subsistence Fishing. The subsistence sector is also quite diverse. Subsistence fishing can include gleaning, canoe fishing, gill netting, cast nets, fish drives, fish traps, torch fishing, and trolling from motorized skiffs. While the value-added ratio for each activity is different, in general, it should be possible to categorize subsistence fishing into two sets of activities: (i) those that involve motorized boats, and (ii) those that do not. The nonmotorized fishing activities have a very low level of intermediate cost and, therefore, a high value-added ratio. It would be rare for the value-added ratio of the non-motorized activities to be less than 90%. In contrast, the motorized subsistence fishing activities range from high-cost trolling to medium- and low-cost bottom fishing. Estimating the value-added ratio of the nonmotorized activities is likely to prove most difficult; but, given the high percentage of value-added in these activities, slight errors in the value-added ratio used for them is unlikely to result in a major difference in the estimated contribution to GDP. The value-added from motorized fishing activities should be very similar to that of the small-scale commercial fishing. Given the difficulty in separating the gross output of each activity in the subsistence sector, a reasonable approach is to estimate an average value-added ratio weighted by the proportion of the catch (by value) taken by nonmotorized and by motorized fishing activities.

Sources of Value-added Ratios

In this report, the consultants have relied upon (i) published estimates of value-added ratios, (ii) the ratios used in calculating national accounts in various countries, (iii) reported income and expenditure data for some activities, (iv) discussions with people involved in the industry, and (v) their own knowledge and experience. Most of these sources are listed in the following tables.

Table 1: Available Sources of Value-added Ratios for Locally-based Offshore Fishing

Activity	Source	Value-added Ratio (%)
Pole and Line Fishing	Smith and Tamate, 1999	60.0
Longline Fishing	Fiji Offshore Fisheries Council, pers. com., 2001	45.0
	FSMSAM	12.1
	Lightfoot, 2000 (PNG study)	33.0–55.0
	Lightfoot and Friberg, 1997 (albacore)	35.0
	McCoy, 1998	28.5–42.8
Purse Seine	FSMSAM	61.0
	Lightfoot, 2000 (PNG study)	61.7–67.6
Unspecified	Fiji Bureau of Statistics Survey	53.5
	Marshall Islands National Accounts	40.0
	Tonga National Accounts	65.0

FSM = Federated States of Micronesia; PNG = Papua New Guinea; SAM = Social Accounting Matrix.

Value-added Ratios used in this Report

The value-added ratios used in the following sections of this report can be broadly classified into three groups: (i) large-scale offshore fishing, (ii) small-scale commercial fishing, and (iii) subsistence fishing. In addition, value-added ratios for aquarium fish and related products, seaweed cultivation and collection, and pearl culture have been identified and used.

Large-scale offshore fishing	40–55%
Small-scale commercial fishing	55–70%
Subsistence	
Nonmotorized	90%
Motorized	65–75%
Aquarium fish	
Marshall Islands	55%
Cook Islands/Kiribati	80%
Seaweed cultivation	90%
Pearl culture	80%

Depending on the consultants’ judgment about the mix of activities and the likely intermediate costs of those activities, the value-added ratios used in this report vary.

Table 2: Available Sources of Value-added Ratios for Small-scale Commercial Fishing

Activity	Source	Value-added Ratio (%)
Skiff Fishing (Yamaha + 40 hp outboard)	Fiji Bureau of Statistics village survey	55.5
	Niue National Accounts	65.0
	M. Savins, pers. com., 2001	41.2
	Sekuri, 2001 (Suvavou village)	50.0
	Tevita, 2001 (Nabukalau Creek, Suva)	65.0
Other Artisanal Boa	Cook Islands National Accounts	60.0
	FSMSAM	68.1
	Fiji Bureau of Statistics village survey	54.7
	Lightfoot and Friberg, 1997	40.1–56.1
	Niue National Accounts	65.0
Diving (beche-de-mer, Aquarium fish)	Cook Islands National Accounts	80.0
	Marshall Islands National Accounts	50.2
Seaweed Cultivation	-No sources-	—
Pearl / Pearl Shell Cultivation	Cook Islands National Accounts	80.0 – 90.0
Unspecified	FSMSAM	58.1
	Marshall Islands National Accounts	76.3
	Tonga National Accounts	80.0
	Tuvalu National Accounts	55.0

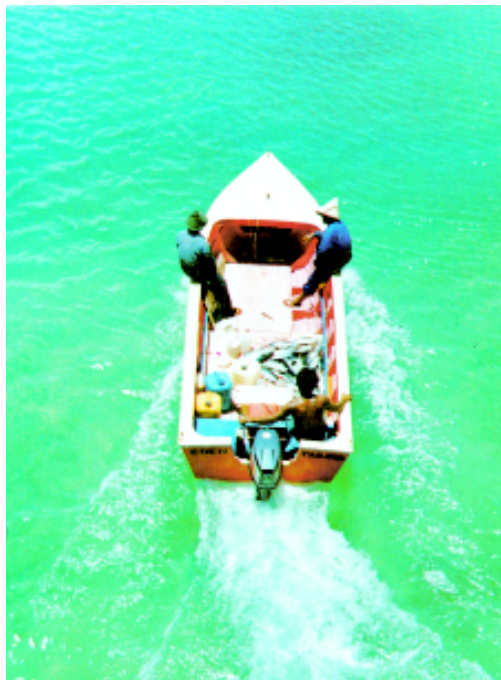
FSM = Federated States of Micronesia; SAM = Social Accounting Matrix.
hp = horsepower.

Table 3: Available Sources of Value-added Ratios for Subsistence Fishing

Activity	Source	Value-added Ratio (%)
Reef Gleaning	-No sources-	—
Bottom Fishing	-No sources-	—
Trochus Collecting	-No sources-	—
Trolling from Skiff	-No sources-	—
Unspecified	Marshall Islands National Accounts	95.0
	Niue National Accounts	65.0
	Tonga National Accounts	80.0
	Tuvalu National Accounts	85.0–90.0



Photograph 1: Transshipping from a Tuna Purse Seiner at Pohnpei



Photograph 2: Trolling for Skipjack



Photograph 3: Collecting Giant Clam Meat in Tokelau

The fishing operations, as shown in the photos above, are respectively large-scale offshore (Photograph 1), small-scale commercial (Photograph 2), and nonmotorized subsistence (Photograph 3). For purposes of GDP calculation, the value-added ratios are quite different for each of these categories of fishing. In this report, value-added ratios of 40–55% are used for large-scale offshore fishing, 55–70% for small-scale commercial fishing, and 90% for nonmotorized subsistence fishing.

Current Contributions of Fishing to GDP in Pacific Island Countries

Official Information on GDP and Fishing Contributions

Appendix 1 gives for each of the Pacific Island countries the official GDP and the official fishing contribution to GDP. Methods used in the official calculation of the fishing contribution to GDP are also presented, and some comments are made on the suitability of those methods.

The official data on GDP and fishing contribution are summarized in Table 4.

Rationale for Re-estimating the Fishing Contribution to GDP

The fishing sector is complex. It includes thousands of producers operating in many locations and using a wide variety of techniques. Crew are often paid in kind or receive a share of the catch rather than wages; and even when they do receive wages, collecting information on those wages can be difficult. In comparison to other sectors of Pacific Island economies such as government, manufacturing, or tourism, calculating the contribution of fishing to an economy is a particularly difficult task.

In most Pacific Island countries, there is surprisingly little cooperation between the fisheries agencies and the statisticians responsible for compiling the national accounts. Given that the calculation of fishing contribution to an economy requires considerable insight into the technical aspects of fishing, this lack of cooperation is disconcerting. Although fisheries agencies appear eager to have the importance of fishing to an economy properly reported, most seem to be ineffective in ensuring that this happens.

While the fishing sector is undoubtedly very important in all Pacific Island countries, in most, it accounts for a relatively modest share of GDP. Given this situation, it is unreasonable to expect the compilers of national accounts to dedicate a large proportion of their

time to measuring the contribution of fishing to the economy. This constraint, when combined with the complexity of the sector and the lack of cooperation with the fisheries agencies, results in a situation where the estimated contribution of fishing to GDP is often inaccurate.

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, the consultants considered it essential to re-estimate the fishing contribution to 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 calculating the fishing contribution to GDP.

Re-estimates of the Fishing Contribution to GDP

The methods used in calculating the fishing contribution to GDP of the various countries were analyzed by the consultants. Comments on the suitability of these methods are given in Appendix 1.

In some of the countries, the methods used to calculate the fishing component of GDP were well documented. In others, this information was obtained verbally. It is likely that at least some of this 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 used in a particular country.

The consultants re-estimated the fishing contribution to GDP in each of the countries. The methods used and the new estimates are given in Appendix 1. The official figures and re-estimates are summarized in Table 5.

Table 4: Official GDP and Fishing Contribution of Pacific Island Countries, 1999

Country	GDP in Local Currency Current Market Prices ('000)	Fishing contribution to GDP in Local Currency ('000)	GDP in US\$ Current Market Prices ('000)	Fishing Contribution to US\$ ('000)	Fishing Contribution as % of GDP	Comment
Solomon Islands	1,352,700	173,174	279,593	35,794	12.80	Total GDP data are indicative only. Fishing contribution was estimated from the production data.
Kiribati	74,592	8,785	48,124	5,668	11.78	
Samoa	705,914	56,399	233,507	18,656	7.99	
Marshall Islands	97,312	7,203	97,312	7,203	7.40	
Tonga	251,135	17,899	157,018	11,191	7.13	Data are for financial year 1999/2000.
Tuvalu	22,045	1,492	13,849	937	6.77	Data are for 1998.
FSM	229,870	10,806	229,870	10,806	4.70	Data are for 1998.
Cook Islands	155,650	4,415	82,372	2,336	2.84	In 2000, fishing contribution increased to 11.3% due to improved data on pearl industry.
Palau	113,485	3,148	113,485	3,148	2.77	Fishing contribution is calculated using the factor cost contribution, rather than the market price contribution. It was not possible to isolate the subsistence fishing component, so it was estimated from the production data.
Fiji Islands	3,587,300	84,100	1,821,334	42,699	2.34	Both GDP and fishing contribution were estimated.
Nauru	80,000	1,696	51,613	1,095	2.12	
Niue	14,199	234	7,514	124	1.65	
Vanuatu	29,206,000	278,000	226,280	2,162	0.96	
PNG	8,780,800	49,300	3,415,590	19,177	0.56	Subsistence fishing is not included in the official fishing

FSM = Federated States of Micronesia; GDP = Gross Domestic Product; PNG = Papua New Guinea. Where available, official information is used. For Solomon Islands and Nauru, figures were estimated. Data are for 1999, unless otherwise noted.

Table 5: Official Fishing Contribution to GDP and Re-estimates (in Local Currency)

Country	Official Fishing Contribution to GDP ('000)	Official Percentage Contribution (%)	Consultant's Re-estimate of Fishing Contribution ('000)	Consultant's Percentage Contribution (%)	Comment
Cook Islands	NZ\$19,410	11.3	NZ\$17,343	9.9	2000 data
Fiji Islands	F\$36,503	1.7	F\$84,616	2.4	1999 data; Subsistence fishing is not included in official estimate.
FSM	US\$10,806	4.7	US\$21,950	9.5	1998 data
Kiribati	A\$8,877	12.0	A\$20,232	21.5	2000 data
Marshall Islands	US\$7,203	7.4	US\$3,605	3.8	1999 data
Nauru	—	—	A\$1,696	2.1	1999 data; no official GDP data
Niue	NZ\$225	1.6	NZ\$266	1.9	2000 data
Palau	US\$3,485	2.7	US\$11,027	8.0	1998 data
PNG	K49,300	0.6	K125,391	1.4	1999 data
Samoa	ST56,399	8.0	ST46,246	6.6	1999 data
Solomon Islands	—	—	SI\$173,174	12.8	1999 data
Tonga	T\$17,899	7.1	T\$18,808	7.5	1999/2000 data
Tuvalu	A\$1,492	6.8	A\$1,556	7.0	1998 data
Vanuatu	Vt 278,000	1.0	Vt 663,924	2.2	1999 data

FSM = Federated States of Micronesia; GDP = Gross Domestic Product; PNG = Papua New Guinea.

Table 4 differs from Table 5 above as the official estimates used in the former are, whenever possible, for 1999 to enable regional comparisons. Table 5, on the other hand, is a summary of the re-estimates that were done for the latest year for which official estimates are available.

Some Observations on Fishing Contribution to GDP

In scrutinizing the methods used in the various Pacific Island countries to calculate the fishing contribution to GDP, certain features and common difficulties emerged. A discussion of some of these issues may help improve future estimates.

In several of the Pacific Island countries, the individuals responsible for calculating the fishing contribution to GDP (sometimes these individuals are responsible for all the other sectors) appear to be unfamiliar with the technical basis of the methods they used for determining the fishing contribution. According to discussions with several such individuals, methods presently being used were developed by a colleague who has since departed. A "recipe" is now being followed, but the rationale for many components is apparently not understood by these individuals to the degree by which they are able to explain the methodology used.

Subsistence fisheries form a large component of the fishing sector in most Pacific Island countries. There are problems dealing with the treatment of subsistence fisheries in GDP calculations in several countries, and these often result in underestimating the importance of the entire fishing sector. In some countries, because the statistics agencies lack data on subsistence fisheries, the contribution to GDP is not calculated and effectively become recorded as zero. In other countries, because of the manner in which subsistence information is collected for GDP purposes, it is not possible to isolate fishing from the other subsistence activities. In which case, the reported "fishing" sector is actually "fishing other than subsistence fishing." The effect on the GDP contribution can be substantial in, for example, Fiji Islands where subsistence fisheries are responsible for over 50% of the domestic fisheries production.

Although in the SNA scheme the processing of fish (packaging, loining, canning) is outside the "fishing" sector, it may often be useful to know the GDP contribution of this fisheries-related activity. In most countries where substantial fish processing occurs, it was not possible for the consultants to identify its GDP contribution because

this information was lumped under the general category on “food processing.” On further reflection over the desirability of isolating fish processing in the national accounts, there appears to be two very different types of fish processing: (i) processing that is intimately related to the fishing and fish resources of the country concerned (for example, the tuna cannery in Madang), and (ii) processing that is unrelated to the fishing and fish resources of the country concerned but rather processing of imported bulk food (for example, the mackerel cannery in the Fiji Islands which uses raw product from the United States [US]).

In the future, it is likely that an increasing share of the benefits from “fisheries” will come from fish processing. This being the case, there is a strong argument for the national accounts to disaggregate within the food processing sector the specific contribution of fish processing. The Fiji Islands has recognized this advantage and, in the future national accounts, the value added from fish canneries will be shown separately.

A common problem encountered by the consultants was the discrepancy between the official figures and other probably more reliable sources of information for a crucial input into the GDP calculations. This frequently occurs when export information is used to value the gross output of a subsector of the fishing sector. Official export figures in the Pacific Island countries characteristically undervalue exported commodities, especially fisheries products. Frequently, there is better information available from such sources as the industry, independent observers, fisheries agencies, and audited accounts of exporting companies. Statistics departments, however, often use the official figures because (i) the data can easily be accessed, (ii) they are required by government policy to use such figures, (iii) these do not require technical insight to make a judgment call, (iv) there is the perception that these figures are not biased by commercial factors, or (v) of a desire for consistency. Despite these reasons, the net result of calculating GDP using obviously inaccurate official information is lowered credibility for the national accounts.

One of the difficulties facing any analyst trying to determine the value added to GDP by small-scale fishing is the scarcity of information on the economics of small-scale fishing in the Pacific Island countries. It is noted that in the 1980s the assistance provided to the Pacific Island countries by the FFA included support for the analysis

of the economics of small-scale fishing. In the early 1990s, when the FFA changed its focus of operations to concentrate almost entirely on the tuna fisheries, the organization virtually ceased its involvement in the analysis of small-scale coastal fisheries. Despite the clear need for further work in the area, the task was not taken up by SPC or any other regional organization. One important consequence is that there is little information available on the economics of small-scale fisheries. This information would be of considerable assistance to the compilers of national accounts.

HIES are a valuable tool for obtaining national account information including fisheries. In addition, it was noted that for some countries, like Tonga and FSM, these surveys are an important source of information on national fisheries production. It was noticed, however, that many of the HIES used were quite old. Also, the fisheries information produced from the HIES could have been made more useful had there been some technical inputs from the government fisheries agency into the survey design.

There appears to be a lack of “champions” for the fisheries sector. In many sectors of the economies of Pacific Island countries, there are groups or individuals who are vocal at stressing the importance of their respective sector, supplying the government with information that emphasizes this importance, and correcting government information/statistics which downplay this importance. There do not appear to be such champions for fisheries, as there are in tourism, manufacturing, and the other sectors.

Fisheries Production Levels

Summary Information

Information on the annual fisheries production in each of the Pacific Island country is given in Appendix 2. These data are used to compile the following summary tables (Table 6 and Table 7) and figure (Figure 8).

Table 6: Estimated Annual Fisheries Production of Pacific Island Countries by Volume, late 1990s (in mt)

Country	Subsistence Fishing	Coastal Commercial Fishing	Offshore Local Fishing	Offshore Foreign Fishing	Total
PNG	26,000	5,500	50,500	85,000	167,000
Kiribati	10,000	6,000	0	132,000	148,000
FSM	5,000	5,000	2,499	127,000	139,499
Solomon Islands	13,000	3,200	73,328	948	90,476
Tuvalu	880	220	0	40,532	41,632
Nauru	110	315	50	41,000	41,475
Fiji Islands	21,600	9,320	5,500	917	37,337
Marshall Islands	2,800	444	0	33,217	36,461
Samoa	4,293	3,086	5,156	100	12,635
Tonga	2,863	4,173	800	45	7,881
Palau	1,250	865	2,500	124	4,739
Vanuatu	2,700	230	0	118	3,048
Cook Islands	795	80	75	300	1,250
Niue	194	12	0	2	208
Total	91,485	38,445	140,408	461,303	731,641

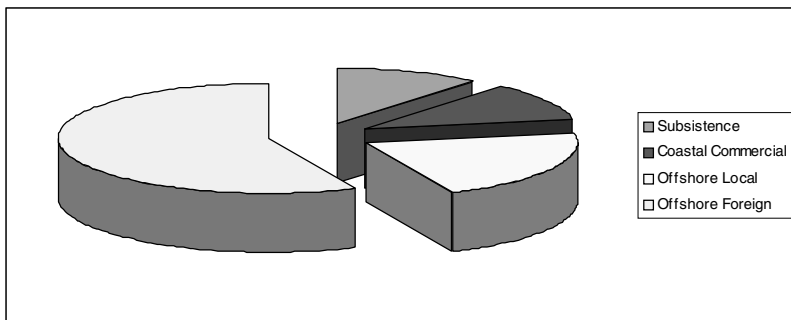
FSM = Federated States of Micronesia; mt = metric ton; PNG = Papua New Guinea.
Source: As per country production sections in Appendix 2.

Table 7: Estimated Annual Fisheries Production of Pacific Island Countries by Value, late 1990s (in US\$'000)

Country	Subsistence Fishing	Coastal Commercial Fishing	Offshore Locally Based	Offshore Foreign Based	Total
FSM	10,000	14,500	12,495	144,000	180,995
PNG	20,227	21,394	44,344	75,074	161,039
Kiribati	7,890	6,310	0	132,258	146,458
Solomon Islands	8,061	1,902	69,242	827	80,032
Fiji Islands	24,675	15,232	25,640	555	66,102
Marshall Islands	3,836	973	0	50,000	54,809
Tuvalu	931	284	0	38,000	39,215
Nauru	332	1,118	250	36,774	38,474
Samoa	7,143	6,583	9,840	99	23,665
Tonga	3,992	10,856	3,676	104	18,628
Palau	2,500	2,595	12,500	270	17,865
Cook Islands	1,164	10,320	397	407	12,288
Vanuatu	3,975	682	0	253	4,910
Niue	167	51	0	4	222
Total	94,893	92,800	178,384	478,625	844,702

FSM = Federated States of Micronesia; PNG = Papua New Guinea.
 Source: As per country production sections in Appendix 2.

Figure 8: Estimated Annual Value of Fisheries Production for All Pacific Island Countries, late 1990s



The methods used to assign values to fisheries production require some explanation.

- **Subsistence Fisheries.** There are several ways of determining the value of subsistence fisheries production. Passfield (1997) discusses some of these methods. "Farm gate" pricing is the method recommended by SPC in Bain (1996), and is the method used in the present study.
- **Coastal Commercial Fisheries.** The valuation of the production of coastal commercial fisheries is made using the best information available. Depending on the country, this ranges from recent studies on fish marketing to a near lack of any documentation. In the latter case, information was obtained by telephone from the countries concerned and by using information in Dalzell et al. (1996), with adjustments for price changes.
- **Offshore Fisheries.** For the offshore fisheries, the values used for locally-based vessels are estimated using free on board (FOB) prices. Applying this concept to the foreign-based offshore fisheries, the values given are the overseas market prices less the costs of getting the products to these markets. The Market Adviser of FFA provided the average values of the average species mix for the various Distant Water Fishing Nation (DWFN) gear/nationality combinations. Transshipment costs were subtracted from these prices to arrive at an in-country value for the catch.

As 1999 is the most recent year for which most the Pacific Island countries have GDP information, efforts to estimate fisheries production were focused on that year. Given the relative size of the offshore fisheries, any atypical features of the tuna fisheries in 1999 may affect the average situation that the estimates were intended to portray. Because Hampton et al. (2000) indicate that 1999 was typical of a La Niña situation, with the Southern Oscillation Index remaining in the positive range throughout 1999, it is likely that the year was not unusual for tuna fishing.

General Comments

In attempting to obtain national fisheries information for this study, it became apparent that most countries in the region have

very limited knowledge of overall national fisheries production. Typically, government fisheries agencies give low priority to estimating the total amount of domestic catches. In general, the smaller the scale of the fishing, the less is known about the production levels, with quantitative information being especially scarce for the subsistence fisheries. Samoa, where a survey of village fisheries has recently been completed, is a notable exception.

Where attempts have been made to estimate national production from small-scale fisheries, the estimates have usually been made from data gathered from HIES, nutrition, and other surveys outside the fisheries sector. In the cases where this information has come from surveys focused on fisheries, the techniques have usually involved dietary recall rather than methods such as creel surveys or sampling at landing points. Considering this dependence on recall, some validation (“ground truthing”) may be in order.

In calculating national fisheries production, once a figure for the national production of the fisheries sector (or subdivision) has been established, it is common practice to use that figure for years or even decades with little adjustment except for population growth. This can produce erroneous estimates, especially when the original estimates were of poor quality.

Some notable patterns in the fisheries production data are:

- (i) The weighted average price per kg for the whole region for the various categories are \$1.04 for the production from subsistence fisheries, \$2.41 for coastal commercial, \$1.28 for locally-based offshore, and \$1.04 for foreign-based offshore.
- (ii) The ranking of countries by total fisheries production is strongly influenced by the level of tuna catches.
- (iii) There is a general pattern of decreasing total national catches if one goes from west to east across the region, and from equatorial to higher latitudes.
- (iv) The value of longline tuna relative to purse seine tuna is apparent from the ranking of FSM (third place in volume but first place in value) due to relatively more longlining activities in FSM than in PNG or Kiribati.
- (v) The Fiji Islands appears to have the largest non-tuna production, in terms of both volume and value.
- (vi) The production from Tuvalu and Nauru is almost entirely related to tuna fishing.

Comparisons with Previous Work

The only previous attempt to estimate and summarize volumes and values of national fisheries production in the Pacific Island region was that by Dalzell, Adams, and Polunin (1996) in "Coastal Fisheries in the Pacific Islands" (herein referred to as the Dalzell study). The information contained in the Dalzell study, as well as in numerous other studies of fisheries in the region, has proven extremely useful for the present survey. For some countries, the Dalzell study remains the sole estimate of total national coastal fisheries catches.

The present survey used, among others, the Dalzell study, more recent surveys, and studies outside the fisheries sector containing relevant information. There are some differences in the results of the Dalzell study and the present study. Some of these differences reflect actual changes in fisheries over the past 10 years (e.g., increased commercialization of fisheries in FSM). Others arise because of the availability of additional information on which to make the estimates (e.g., the use of HIES information in Tonga); while others reflect distortions due to changes in the value of local currencies relative to the US dollar (e.g., the PNG kina devalued 270% during the decade).

Bearing the above in mind, some observations can be made on the differences between the present study and that of Dalzell's:

- **Subsistence Production.** The volume estimates made in this study are about 25% higher than those in the Dalzell study. This seems reasonable considering the population of the region increased by about 27% during the 1990s (Ryan and Stepanoff 2000). The country which showed the largest difference in volume estimates was Tonga, where the difference is mainly due to the use by the present study of information from an HIES. Differences in the value of the subsistence catch between the two studies were also significant, with the present study using value estimates which are about 50% less than those used in the Dalzell study. This difference in value estimates can mostly be attributed to (i) the method used to value subsistence catches (the present study used the "farm gate" scheme for valuation, while the Dalzell study mostly used full market values), and (ii) the changes in local currency exchange rates relative to the US dollar, especially in PNG and the Solomon Islands.

- **Commercial Coastal Production.** In this study, estimates of the catch volume are almost 50% higher than in the Dalzell study. FSM and Samoa reported significant *real* increases in volume estimates, while other countries showed increases which are mainly due to the availability of better information (e.g., Tonga, Solomon Islands, and Tuvalu). The value estimates in US dollars of the commercial coastal production generally increased by about 35%. There are, however, countries that showed a decrease in value estimates. The drop may be due to actual declines in either activity (Vanuatu) or exchange rates (Fiji Islands). The major increase in volume/value reported for the Cook Islands is due to the inclusion of pearl aquaculture in the estimates of the present study.

Summary of Information on Employment, Exports and Imports, Access Fees, and Fish Consumption

Fisheries-related Employment

Information on employment in the fisheries sector is given for each Pacific Island country in Appendix 2.

It is difficult to summarize the available information on the contribution of fisheries to employment in Pacific Island countries for several reasons:

- (i) The various sources of information on fisheries employment range from informal estimates to structured surveys.
- (ii) The data originate from studies ranging from initiatives confined to the fisheries sector to much broader exercises that covered all economic sectors or the entire population.
- (iii) The various terms used to categorize employment (e.g., subsistence, employment, total employment, paid work, workforce, fisher) differ between studies and between countries.
- (iv) The studies deal, in different ways, with the various mixes of paid, unpaid work, and work for the family.
- (v) There is inconsistency across countries in the categorization of fish processing. In some countries, it is placed in the same sector as fishing; while in others, it is in manufacturing.
- (vi) Some of the studies have produced obviously erroneous results; for others, it is difficult to establish credibility.

Bearing the above in mind, an attempt has been made to extract from Appendix 2 nominal information for each country on the relative importance of fisheries employment. This is given in Table 8 below.

As presented in Table 8, the available information on fisheries employment in Pacific Island countries is a heterogeneous assemblage of facts. This reality and the differences in the usage of terms,

especially “employed” and “fisher,” make it difficult to compare data between countries, or even between surveys in the same country. For example:

- In one survey in Samoa, a “fisher” is defined as a person who participated in fishing during the 1-week period prior to the survey. In another survey, a “fisher” is defined as a person who participated in fishing during the 2-week period prior to the survey. But, in the Solomon Islands, a “fisher” refers to a person whose main activity is fishing.
- In FSM, “employed” includes “formal workforce” and both market-oriented and subsistence agriculture/fishing. However, in Palau, “employed” is defined as “at work at all times during the reference week as a paid employee.”

Despite its shortcomings, some observations can be made on the existing information on the importance of fisheries employment:

- (i) The importance of fisheries in subsistence seems to have a strong relationship to the type of island. The level of significance is highest in atolls, followed by small islands, and least in large high islands. This pattern is somewhat altered by PNG with its important freshwater subsistence fisheries.
- (ii) The importance of fisheries in formal employment seems to be related more to business conditions than to island type. These conditions include, among others, proximity to processing facilities, schedule of airline connections, and fuel taxation. Most formal employment in fisheries appears to be tuna-related.
- (iii) The accurate portrayal of the importance of women in fisheries employment appears to be negatively affected by (i) the concept of using “main unpaid activity” for defining the subsistence fisheries sector, as it downplays the importance of secondary activities (e.g., even for women who do considerable fishing, childcare is often the main unpaid activity); and (ii) placing commercial fish processing (where many women are employed) in the manufacturing sector.
- (iv) Where commercial fish processing occurs (e.g., canning, loining) and where this is attributed to the fisheries sector, the increase in size of fisheries employment is remarkable.
- (v) Overseas employment in industrial fishing vessels does not appear to be captured in many of the employment surveys.

Table 8: The Relative Importance of Fisheries in Paid Employment and in Subsistence

Country	Basic Information on Fisheries-related Employment
Cook Islands	About 22.0% of the population, or approximately 4,435 people, were involved in subsistence fishing. The 160 jobs in fisheries represent about 3.0% of all formal employment.
Fiji Islands	The 6,246 jobs in fishing represent about 2.2% of the 280,505 people formally and informally employed in the country, as reported in the 1996 census.
FSM	A total of 10,285 private sector employees were enrolled in the Social Security System in 1997. Of these, 767 individuals (7.4%) were from the fishing sector.
Kiribati	Of the 7,848 people who had "cash work," 349 people (4.4%) had fisheries-related jobs—e.g., seaweed grower, coastal fisherman, deepsea fisherman, or other fisheries workers. About 12.0% of the households in Kiribati do not fish. Of those that do fish, 17.0% fish commercially full time, 22.0% fish commercially part-time, and 61.0% fish only for subsistence.
Marshall Islands	An estimated 2.8% of all employment is in fishing.
Nauru	There are 100 half-time commercial fishermen, which would be equivalent to 50 full-time fishermen. The census indicated 1,917 formally-employed people.
Niue	Around 61.0% of the households performed some form of fishing activity.
Palau	There are 200 commercial fishers and 1,100 noncommercial fishers in a population of 19,000. These fishers represent about 6.8% of the total population.
PNG	Out of 130,963 citizen rural households, about 23.0% are engaged in catching fish. Of this, about 60.0% caught fish for own consumption only, and the rest caught fish for both own consumption and for selling.
Samoa	A total of 500–600 people therefore appear to be formally employed in the fishing sector in Samoa. One third of the total number of households in Samoa is engaged in some form of fishing.
Solomon Islands	About 6.0% of employment in "paid work" are in "fishing and related activities." About 5.0% of the people involved in unpaid work had fishing as their "main unpaid activity."
Tonga	Approximately 8.0% of paid employment are in the fisheries sector; and 3.2% of economically-active people are in the fisheries sector.
Tuvalu	Formal cash employment in fisheries represents around 5.3% of all cash employment. Traditional fisheries activity for subsistence represents 19.6% of all traditional activity.
Vanuatu	An estimated 35.0% of the 22,000 rural households in Vanuatu were engaged in fishing during the seven-day period prior to the census. Of these fishing households, 40.0% reported selling fish for some form of income.

FSM = Federated States of Micronesia; PNG = Papua New Guinea.

Source: As per country employment sections in Appendix 2.

Where there have been attempts to estimate a “regional total” of fisheries employment (e.g., 81,000 Pacific Islanders are engaged in small-scale commercial fishing [Hamnett 1990]), the methodology used is unknown.

It is not rational to make any regional estimate by combining dissimilar country-specific employment information (such as that appearing in Appendix 2 of this report). However, some conjecture on the subject could be made and may even prove useful, if only to encourage refinement of the employment estimates.

McCoy (1991) estimated that, in the Pacific Islands, there were 17,080 motorized fishing vessels and 24,612 nonmotorized fishing vessels. If it is assumed that (i) 75% of the motorized vessels and 10% of the nonmotorized vessels are used in some form of commercial fishing, and (ii) an average of three crew are carried on a motorized commercial vessel and 1.5 crew are carried on a nonmotorized commercial vessel, then the number of employed in commercial fishing is about 42,000. This figure must, however, be adjusted by (i) the commercial fishers who do not use a vessel, and (ii) the 1,200 men that McCoy and Gillett (1997) estimated to be working on the 10 major foreign fleets operating in the region. Using this reasoning, about 45,000 Pacific Islanders appear to be presently involved in commercial fishing in the region.

Of relevance to the present study on the economic importance of fisheries, few of the surveys which produced information on fisheries-related employment were (i) specifically designed with the objective of determining the relative importance of employment in the various sectors, and (ii) formulated with sampling strategies appropriate for the fisheries sector.

The Fiji Islands’ 1998 Employment Survey provides an example of a survey using a sampling strategy suitable to the fisheries sector. Intuitively, the amount of fishing employment suggested by the survey seems low—340 people with paid employment. In another study, it has been estimated (Gillett et al. 2001) that the Fiji domestic longliners alone employ 340 people as crew. Discussions with the Fiji Bureau of Statistics officials revealed that the following may have contributed to their low estimate:

- (i) The survey used the postal enquiry system in which questionnaires were mailed out. Large firms (e.g., gold mining, garment manufacturing) are more likely than small fishing enterprises

to return the forms, or subsequently respond to government pressure to return the forms.

- (ii) The framework of the survey is based on the business register, and the smaller the firm, the less likely it is to be on the register.
- (iii) The survey and the follow-up for nonresponse were focused on the islands of Viti Levu and Vanua Levu, whereas there are many fishing enterprises located outside of the Fiji Islands' two main islands.

Other information on fisheries employment in the Fiji Islands suggests that the 1998 survey underestimated fisheries employment by more than an order of magnitude. One lesson learned from this example and from other employment surveys encountered during the present study is that, due to the complexity of the fisheries sector, it is relatively difficult to examine. Simple sampling strategies, which may be suitable for other sectors, may not be appropriate for estimating employment in the fisheries sector.

To accurately gauge the relative importance of fisheries in national paid employment, it is necessary to have a survey that covers all sectors of the economy, rather than just have a fisheries-specific study. The sampling strategy for such a national level study (e.g., national census, HIES, labor survey) must not be biased against particular sectors, which in the case of fisheries would require at least some dialogue between the designers of the survey and those with technical expertise in fisheries.

To accurately gauge the relative importance of fisheries in subsistence activity, the concept of enumerating subsistence fishers appears inappropriate. It would be more realistic to partition subsistence activity into its various sector components. This activity analysis, as with the paid employment survey above, would need to be done at a level higher than the fisheries sector to accurately portray the relative importance of the various subsistence activities, including fishing.

Exports and Imports of Fishery Products

Summary of Nominal Information

Table 9 lists the nominal values of fishery product exports. Data are for 1999, unless otherwise indicated. For several countries, there

Table 9: Estimated Annual Value of Fisheries Exports of Pacific Island Countries

Country	Nominal Value (US\$)	Fisheries Exports as a % of All Exports	Comment
Cook Islands	2,919,136	81.9	
Fiji Islands	29,193,745	6.0	
FSM	4,878,387	94.7	1997 data for exports
Kiribati	1,483,871	16.9	
Marshall Islands	473,000	6.2	
Nauru	0	0.0	
Niue	0	0.0	
Palau	2,213,419	73.0	1996 data
PNG	48,106,666	1.8	
Samoa	10,785,287	61.5	
Solomon Islands	35,472,033	20.0	1997 data for exports
Tonga	2,573,670	23.8	
Tuvalu	4,233	1.2	Fisheries export ratio for 1998 (latest year for which total export information is available)
Vanuatu	394,954	< 1.0	2000 data for exports; 1999 data for export percentage
Total	138,498,401	—	

FSM = Federated States of Micronesia; PNG = Papua New Guinea.
Source: As per country export sections in Appendix 2.

are multiple estimates of exports, in which case the official export figure, or the nearest resemblance to such a figure, is used.

The available data on fisheries imports for each of the Pacific Island countries are given in Appendix 2. For many countries, the official information on imports available to the present study did not disaggregate the import data to the level where fisheries imports could be identified. The case of the official import data of the Cook Islands is typical:

Statistics Office (2000a) gives the total imports of the Cook Islands as NZ\$77,196,000, of which “food and live animals” make up NZ\$18,739,000. The publication does not give specific information for seafood imports.

At least, some summary information on fisheries imports is available from each country; but in many cases, it is from nonofficial sources and/or dated. The varied nature of the data prevents any regional comparisons. The information from the export and import sections of Appendix 2, which are deemed to be the most representative, is given in Table 10.

Table 10: Imports of Fishery Products of Pacific Island Countries

Country	Basic Information on Imports
Cook Islands	In 1991, there was about NZ\$300,000 of imported seafood products, excluding canned fish.
Fiji Islands	F\$28,174,630 worth of fishery products was imported in 1999.
FSM	Imports of canned fish were US\$1,041,000; US\$977,000; and US\$1,730,000 in the years 1975, 1996 and 1957, respectively.
Kiribati	About 380 mt of seafood products, worth A\$572,840, was imported in 1995.
Marshall Islands	US\$500,190 worth of fishery products was imported in 1999.
Nauru	There is a substantial amount of canned fish in the stores. Most of the non-canned fishery product imports come from Taipei, China (milkfish) and Australia (salmon, prawns, sardines).
Niue	About 20 mt of fishery products are imported per year.
Palau	An annual average of 610 mt of seafood products was imported over the period 1994–1997.
PNG	Approximately 35,539 mt of fishery products, worth US\$43.6 million, were imported in 1996.
Samoa	There is an annual import of 2,450 mt of canned fish.
Solomon Islands	About 81 mt of fishery products were imported in 1999.
Tonga	An estimated 712 mt of fishery products, worth T\$1,356,980, was imported in 1999.
Tuvalu	Canned fish imports in 2000 were estimated at A\$7,366.
Vanuatu	Total value of all fishery products imported was US\$735,000 in 1993.

FSM = Federated States of Micronesia; mt = metric ton; PNG = Papua New Guinea.
Source: As per country import sections in Appendix 2.

Some Observations on the Fisheries Export and Import Data

Some of the interesting features of the export and import data are:

- (i) In general terms, the region exports tuna and other high-value species such as trochus and beche-de-mer, while importing canned and inexpensive frozen fish.
- (ii) Tuna products dominate the fisheries exports of the region. For the five main exporting countries, tuna (fresh, frozen, and processed) overshadows all other fisheries exports.
- (iii) Canned mackerel dominates the fisheries imports.
- (iv) The relatively new aquarium fish industry is responsible for a significant portion of fisheries exports. The nominal FOB value of exports of aquarium fish for the year 1999 are Cook Islands US\$73,500; Fiji Islands US\$178,000; Kiribati US\$1,160,000; Marshall Islands US\$473,000; and Vanuatu US\$16,500. Aquarium fish exports from Kiribati and the Marshall Islands now account for 78% and 95%, respectively, of all fisheries exports from those countries.
- (v) There is considerable inter-annual variation in fisheries exports.
- (vi) The amount of fishery products exported as passenger baggage in many countries is quite large, especially from FSM, Marshall Islands, Palau, and Samoa.

Comments on the Accuracy of the Fisheries Export and Import Data

The most notable feature of fishery trade data in the Pacific Island countries is the underestimation of the value of fisheries exports. This underestimation appears large and relatively worse than in other trade sectors. In most cases, when the official export values are compared to other sources of similar information (e.g., importing country information, Convention on the International Trade of Endangered Species [CITES] records, audited exporting company accounts), the differences are remarkable. There are several possible reasons for the differences:

- (i) Most government customs departments are oriented to taxing imports and may give low priority to documenting exports.

- (ii) Keeping track of fisheries exports, as compared to other major commodities exported by Pacific Island countries, is more complex due to:
 - (a) presence of many exporters;
 - (b) a multitude of different products each with different values;
 - (c) large numbers of small shipments; and
 - (d) many different export points.
- (iii) Often there is no examination by customs departments of the exported commodities.
- (iv) Because much of the exported fish is sold through auctions, exporters typically do not know the price of the products at the time of export.
- (v) There are numerous incentives for exporters to place a low value on exports—e.g., taxation, foreign exchange controls, hiding income from partners.

Another problem in accurately quantifying fisheries exports is that, in many countries, products that would normally be considered fishery products are not being captured in the official export statistics:

- (i) For some countries, fisheries exports are confined to finfish.
- (ii) Coral exports are not considered to be a fishery product in at least two countries.
- (iii) Some countries specifically list a few important fisheries exports, and lump other fishery products together with miscellaneous nonfishery commodities. Consequently, the total value of fisheries exports cannot be determined from official publications.

For imports, when the data identify fishery products, the quality for measuring volumes/values appears better than that for exports. For some countries, however, it is not possible to determine the product form (fresh/frozen vs. canned), which creates difficulties for estimating per capita consumption.

Access Fees

Access fees are a charge for the right to harvest a resource. For the purpose of national accounting, they are considered to be a charge paid by nonresidents for the use of a tangible nonproduced asset. Thus, the fee is not part of the value of production from a fishing activity, and it is therefore not included in the calculation of the fishing contribution to GDP.

Summary of Information

All Pacific Island countries received fees for foreign fishing activity in their waters. For many countries, information on the amounts of these fees is available in published documents; while in other cases, it must be estimated from fishing activity patterns. Table 11 presents the access fees received in 1999 and compares these fees to the national GDP.

Comments on Access Fees

It may be tempting to compare the 1999 access fees above to the value of the 1999 catches under the category "Offshore foreign-based vessels" to determine the ratio of the fee to the value of the catch. This, however, would be inappropriate as, in some countries (e.g., FSM and Palau), there are fee-paying foreign vessels under the category "Offshore locally-based."

In some countries, the access fees form a very large portion of government revenue. In the FSM, for example, the 1999 access fees represented an estimated 39% of non-tax revenue and 22% of total domestic revenue for the national government. In Kiribati, 34% of government income in 1999 was derived from license fees.

Some interesting features from the information presented in Table 11 above are:

- (i) Access fees are only significant for 7 of the 14 Pacific Island countries.
- (ii) There is one case (Niue) in which an apparently small access fee is actually quite significant in terms of the national economy.
- (iii) There is another case (PNG) in which an apparently large access

Table 11: Estimated Value of Access Fees Received from Foreign Fishing Vessels and GDP, 1999

Country	Access Fees (US\$)	GDP (US\$)	Access Fees as % of GDP
Kiribati	20,600,000	48,123,871	42.81
Tuvalu	5,900,000	13,848,788	42.60
FSM	15,400,000	229,869,864	6.70
Nauru	3,400,000	51,612,903	6.59
Marshall Islands	4,982,699	97,311,800	5.12
Niue	151,793	7,514,077	2.02
Palau	800,000	113,484,869	0.70
Cook Islands	169,072	82,371,930	0.21
PNG	5,840,000	3,415,590,478	0.17
Tonga	152,041	157,018,257	0.10
Solomon Islands	273,458	279,593,229	0.10
Vanuatu	218,448	226,280,313	0.10
Samoa	188,616	233,506,665	0.08
Fiji Islands	212,000	1,821,334,281	0.01

FSM = Federated States of Micronesia; GDP = gross domestic product; PNG = Papua New Guinea.
Source: As per country access fees section in Appendix 2.

fee is actually quite insignificant in terms of the national economy.

- (iv) For nearly half of the Pacific Island countries, the US multilateral treaty provides most of the access fees, despite the fact that there is little or no US fishing in those countries.

Fish Consumption

Summary of Information

Appendix 2 contains information on the annual per capita consumption of fishery products in each of the Pacific Island countries. For most of the countries, several estimates have been made. In

Table 12, the ranges of these estimates are given. The listed estimates are confined to the 1990s decade, cover the entire country (i.e., the estimate for the Honiara area is not included in the Solomon Islands range), and exclude estimates which are obviously erroneous. Although it is intended that the given amounts be for whole fish weights, this cannot be verified in some cases.

Table 12: Estimated Annual Per Capita Fishery Product Consumption in the 1990s

Country	Range of Estimates in Per Capita Fishery Product Consumption from Various Studies (kg/year)
Cook Islands	47.0 – 71.0
Fiji Islands	44.0 – 62.0
FSM	72.0 – 114.0
Kiribati	72.0 – 207.0
Marshall Islands	38.9 – 59.0
Nauru	46.7
Niue	49.0 – 118.9
Palau	84.0 – 135.0
PNG	18.2 – 24.9
Samoa	46.3 – 71.0
Solomon Islands	32.2 – 32.7
Tonga	25.2 – 30.0
Tuvalu	85.0 – 146.0
Vanuatu	15.9 – 25.7

FSM = Federated States of Micronesia; kg = kilogram; PNG = Papua New Guinea.
Source: As per country consumption sections in Appendix 2.

Comments on Fish Consumption

A number of observations can be made on the information presented in Table 12:

- (i) In general, countries comprised of small islands have high fish consumption rates, while large island countries have low consumption rates. The exceptions to this are Tonga, where the studies suggest surprisingly low fish consumption rates, and Palau, where fish consumption rate is remarkably high.

- (ii) Most of the Pacific Island countries exceed by a large margin the world average per capita fishery product consumption rate of 13.0 kg (Westlund 1995).
- (iii) Most of the estimates for Kiribati indicate that it has the highest rate of fish consumption compared to any country in the world.

The studies which provided the above estimates used a variety of techniques:

- (i) nutrition studies in which the amount of fish and shellfish consumed was measured;
- (ii) nutrition studies based on dietary recall;
- (iii) HIES which estimated the volume of fishery products consumed;
- (iv) exercises in which the fishery production is divided by the population; and
- (v) exercises that take the fishery production less exports plus imports to arrive at a gross consumption figure that is divided by the population.

Although, in theory, the various techniques should give equivalent results, the situation in Niue is an example where different estimates of per capita consumption were calculated:

- Dalzell et al. (1993) estimated per capita fish consumption using a 1987 SPC nutrition study. It indicated an annual per capita consumption of 40.8 kg food weight, or about 49.0 kg whole fish weight.
- Considering (i) the Niue population of 1,900 people in 2000 (Ryan and Stepanoff 2000), (ii) the subsistence fisheries production of 194 mt, (iii) the commercial production of 12 mt, and (iv) imports of 20 mt, the annual per capita consumption of fishery products in Niue appears to be about 118.9 kg.

This variation suggests the need for some “ground truthing” to gauge the validity of the estimation. This is especially important considering that many of the total national fishery production estimates are derived from nutrition studies.

Quantifying consumption by using import, export and production data is complicated by several factors:

- (i) The low quality of data on the export of fishery products;
- (ii) Uncertainty in some countries over whether the imports of fishery products are whole fish or canned fish;
- (iii) Where there is a large tourist industry, not knowing the full-time-resident equivalent of the tourists. Apparently, only the Palau consumption figures take this into consideration, where the tourist population has been estimated to be equivalent to 500 full-time residents, or 2.6% of the population.

Another important issue in the calculation of per capita fish consumption concerns the estimate of the uppermost limit possible. Some of the very high estimates obtained in the surveys cited in Appendix 2 (e.g., 207.0 kg per capita per year in Kiribati) are criticized solely on the intuitive basis that it is not physically possible to ingest such a large quantity of fish. However, careful examination of specific cases suggests that this concept may not be correct. For example:

- Nube (1989) reported that the Kiribati canned fish imports from 1974 to 1986 ranged from 112 mt to 312 mt per year. Using information from the 1985 census, Nube calculated the daily per capita fish consumption for 18 islands in the Gilbert and Line groups. The results ranged from 0.45 kg in South Tarawa to 2.86 kg in Arorae. Of the 18 islands listed, 11 of the islands (or 61%) have a per capita fish consumption rate greater than one kg per day.
- Passfield (1997) calculated the annual per capita consumption of fish in Tongareva Island as 219.0 kg.

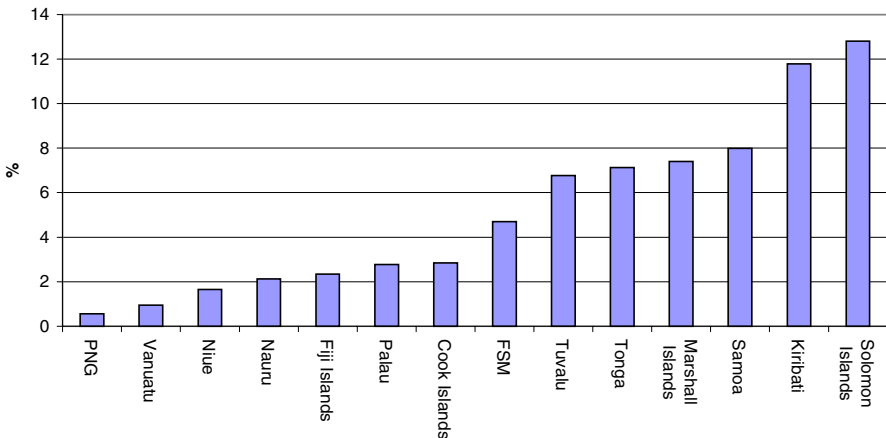
Conclusions and Recommendations

The objectives of the present study were to measure the economic contribution of fisheries to the economies of Pacific Island nations from available data and to contribute to improving the accuracy of this measurement. The conclusions and recommendations are therefore grouped according to these objectives.

Measuring the Economic Contribution

The official fishing contribution to GDP in various Pacific Island countries in 1999 is given in Section 4.1. The importance to the economies of Pacific Island countries, as measured by the percentage of GDP, is given in the Figure 9.

Figure 9: Official Estimates of Fishing Contribution to GDP of Pacific Island Countries, 1999



In countries where official estimates are not available (Solomon Islands, Nauru), estimates were made during this study for purposes of comparison.

A major conclusion of the present study is that, in most Pacific Island countries, the fishing contribution to GDP has been underestimated. In five countries, the consultants’ estimates are more than double that of the official figures. In two cases, the consultants’ estimates are lower than the official estimates albeit, in the case of the Cook Islands, the difference is too small to be significant. The differences between the consultants’ estimates and the official estimates are shown in Table 13.

Table 13: Difference between Consultants’ and Official Estimates of Fishing Contribution to GDP

Country	Difference in Estimates (+ / -) (%)
Increased	
Palau	+441.1
Papua New Guinea	+154.3
Vanuatu	+138.8
Fiji Islands	+131.8
Kiribati	+127.9
Federated States of Micronesia	+103.1
Niue	+18.2
Tonga	+5.1
Tuvalu	+4.3
Decreased	
Cook Islands	-10.6
Samoa	-18.0
Marshall Islands	-50.0
No Official Estimates	
Nauru	—
Solomon Islands	—

There is no single reason for the differences in the estimates. In some countries, notably FSM and PNG, the differences are primarily due to the inclusion of subsistence fishing in the consultants’ estimates. In other countries, in particular Palau, the difference is primarily due to the methods used. In most, it is a combination of differences in the estimate of production and the method used to calculate the contribution. For example, in Samoa, subsistence production was valued at the full market value, rather than at “farm gate” prices.

At one extreme, both Nauru and the Solomon Islands have major problems preparing their national accounts. The difficulty in computing the fishing component of these accounts is part of the overall problem. At the other extreme, Cook Islands, Niue, Tonga and Tuvalu all compile soundly based national accounts that include reasonable estimates of the fishing contribution. In most of these latter countries, the differences between the consultants' estimates are small. In general, where the differences between the estimates are 5.0% or less, they are not significant.

The major difference between the consultants' estimate and the official Marshall Islands estimate is due to what seems to be the inclusion in the official figures of a contribution from foreign vessels that ceased operating sometime earlier.

The main lesson learned is that, in the countries where the estimates are markedly different, the process of preparing the national accounts tends to rely on outdated surveys, inappropriate indicators, and/or poorly understood methods. In most of these cases, the compilers of national accounts do not appear to have consulted the relevant fisheries agencies or the industry when preparing their estimates.

Where there is a marked difference between the consultants' estimates and the official estimates, the compilers of national accounts should carefully examine and evaluate the data, the assumptions, and the methods that they are using. This evaluation should include consultation with the relevant domestic and regional fisheries agencies. Where significant problems are identified, they should consider changing their methods and/or seeking outside assistance to revise their methods and approaches to estimating the fishing contribution to GDP.

Improving the Fishing Contribution Estimates

A major conclusion of this study is that the accuracy of the estimate of fishing contribution to GDP could be improved with a closer liaison between the fisheries and the statistics agencies. The fisheries agencies are in a position to provide information on new developments, technical insights, and recent data, all of which could improve the GDP estimates. This cooperation, however, rarely occurs in the Pacific Island countries. Because fisheries agencies have a vested

interest in assuring that the importance of their sector is not underestimated, they should take the lead in improving this cooperation. It is recommended that the fisheries agencies identify an appropriate staff member to serve as the liaison with the statistics agency and with regional organizations. The work program of this individual should be modified to include duties related to measuring the fishing sector's economic contribution.

One of the factors causing an underestimation of the fishing contribution is related to the valuation of the production of small-scale fisheries. The fundamental difficulty is lack of knowledge of volume of production (for which values could easily be estimated). The low quality of fisheries statistics is a persistent problem in the Pacific Island countries, and there do not appear to be any practical solutions for many of the data problems in the fisheries sector. At a recent Food and Agriculture Organization (FAO)/SPC Pacific Islands Regional Workshop on Fisheries Statistics, most of the country representatives acknowledged the low level of information on small-scale fisheries production and the lack of expertise and/or funding in obtaining the information. Given this reality, it is recommended that maximum use be made of survey opportunities *outside* the fisheries sector. At little additional cost, production information on small-scale fisheries could be collected through such tools as the national census, nutrition surveys, agriculture census, HIES, and poverty studies. This would require a pro-active approach on the part of fisheries agencies in the planning stage of these surveys to assure that useful fisheries data are obtained.

In many countries, the underestimation of the value of fisheries exports in official customs statistics is a major source of error in the estimation of the fisheries contribution. The export information situation is worse in fisheries than in other sectors. In the countries where this problem is especially acute, it is recommended that export valuation be based on a broader spectrum of information than solely those provided by customs officials. These additional data could be obtained from the government fisheries agency, industry, and knowledgeable individuals. In addition, the regional organizations involved in fisheries collect data that could be used in valuing exports.

Additional information on the economics of small-scale fisheries would contribute to improving the measurement of the fisheries contribution to GDP. This information would improve the under-

standing of input ratios (for the production approach to GDP) and the various forms of income (for the income approach). Such studies need not be complex but should cover the major small-scale commercial and subsistence fisheries.

The regional organizations could play an important role in improving the measurement of fisheries contribution to the economies of their member countries. Initiatives could include:

- (i) Measures to inform the national statistical agencies of the availability of information relevant to fisheries GDP calculations:
 - (a) SPC databases have detailed information on tuna production and some information on several important export commodities (i.e., trochus, beche-de-mer);
 - (b) FFA has information on the price of tuna in international markets.
- (ii) Specifically targeting the fisheries sector in national/regional national accounts training courses;
- (iii) Developing a capability within the regional organizations to undertake analysis of the economics of small-scale fisheries;
- (iv) Advice on enhancing the work programs of the fisheries economists of government fisheries agencies to facilitate more involvement in measuring the economic impact of their sector;
- (v) Sponsorship of a regional meeting of fisheries economists. It is noted that although the regional organizations have held a multitude of meetings for the various fisheries subsectors (surveillance, law, management, and statistics), there has never been a regional gathering of fisheries economists. Such a meeting could have a positive impact on increasing understanding of technical issues, as well as generating interest among government fisheries agencies in measuring economic contributions.

Other Conclusions and Recommendations

The income approach versus the production approach for the fisheries sector

In those circumstances where the compilers of national accounts have access to comprehensive and detailed information on the income/expenditure of the participants in one or more sectors of the

fishing industry, the income approach is the most appropriate method of calculating the value-added to GDP. In the Pacific Island countries, it is, however, rare for this data to be available for fishing. In these circumstances, the production approach is likely to be the most accurate method for estimating the contribution of fishing to GDP. Even when the compilers of national accounts have access to good quality income/expenditure data, it would be prudent if they cross-checked their calculations against estimates made using the production approach, giving special attention to obtaining accurate value-added ratios and fish prices.

Level of aggregation in national accounts

In the national accounts of most Pacific Island countries, fishing is aggregated with agriculture and other primary industry. In several cases, the fishing component of subsistence is lumped together with all other subsistence activities. This aggregation with other activities can make it very difficult to identify the contribution of fishing to GDP. This practice is understandable and is not really a problem when the fishing contribution to GDP is very small. But when fishing makes a significant contribution to GDP, that contribution should be clearly identifiable in national accounts.

In the future, it is likely that an increasing share of the benefits from the fisheries sector will come from fish processing. Thus, there is a strong argument for the national accounts to disaggregate within the food processing sector the specific contribution of fish processing.

ISIC categories

There are marked differences between the value-added by different fishing activities and, therefore, it is important to distinguish between these activities when estimating their contribution to GDP. At a minimum, analysts should distinguish between large-scale off-shore fishing, small-scale commercial fishing, and subsistence fishing. The small-scale commercial fishing should be further disaggregated into export-oriented and local supply. Creating expanded ISIC sub-categories to cover at least these activities could facilitate this.

Classifying subsistence activities

One of the difficulties facing any analysts using the production approach is determining the appropriate value-added ratios. This

can be particularly difficult for subsistence fishing where the activities range from reef gleaning, which requires very few inputs, to trolling for tuna, where the costs of fuel, lures and boat maintenance are substantial. The large differences between the value-added ratios of these activities make it important to have a clear idea of the proportion of fishing undertaken using each activity. While it may be impractical to try and identify the value-added ratios for each possible subsistence activity, at the least the ratios between motorized and nonmotorized activities should be differentiated.

Extrapolation of HIES data

In most cases, HIES are sample surveys that rely on the memory of the respondents to estimate the level of consumption/expenditure. Even when properly implemented, there is considerable scope for errors in the estimates produced by HIES. As the length of time over which the data are extrapolated increases, the risk of error is compounded. It is normal for changes in the overall population size to be used to extrapolate consumption/expenditure data. Given the marked differences between the consumption and production patterns of rural/urban and coastal/inland populations, the use of changes in the overall population size to extrapolate HIES data could result in a biased estimate.

Economic impact of fisheries

While GDP is an important measure of the role of fishing in an economy, it does not give the overall impact that fishing has on an economy. Although a study of the multiplier effects of fishing would lead to a greater understanding of economic impacts, there is little information in the Pacific Island countries from which the multiplier effects of fishing can be estimated. In fact, there is very little information available to estimate the multiplier impact of any activity in the Pacific economies. It is recommended that further work be undertaken to estimate the multiplier effects of fishing on national income and employment in the Pacific Island countries.



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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:

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

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:

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

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:

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

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:

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

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.

Appendix 2: Country Specific Information on Fisheries-Related Employment, Fishery Production Levels, Exports and Imports of Fishery Products, Access Fees, and the Role of Fisheries in Nutrition

Cook Islands

Employment

In the 1996 census (Statistics Office 1998), the categories of (i) "Home duties" and (ii) "Employed population" are given.

For the "Home duties" category:

- 4,435 people (3,517 males, 918 females) were involved in subsistence fishing.
- The 4,435 represent about 22% of the population.

For the "Employed population" category:

- 401 people (357 males, 44 females) were employed as "skilled agriculture and fishery workers."
- The 401 jobs represent about 7.7% of all employment in the country.

According to officials of the Ministry of Marine Resources, about 40% of the employment in the category "skilled agriculture and fishery workers" would be in the fisheries sector.

Anonymous (1999) indicates that 67% of households are engaged in subsistence fishing.

Anonymous (2000a) gives information on the number of fish-aggregating device (FAD) fishers on Rarotonga:

- The number of full-time FAD fishers (those that earn about 90% of their income from fishing) increased from 7 in 1980 to 20 in 1999.
- The number of part-time FAD fishers (those that fish once per week) increased from 7 in 1980 to 35 in 1999.

It is likely that the downsizing of the public service in the mid-1990s contributed to an increase in the number of people obtaining a livelihood from fisheries.

Volumes and Values of Fish Harvests

Dalzell et al. (1996), using data sources from the late 1980s and early 1990s, estimate the following:

- Subsistence coastal fisheries production of 858 mt, worth US\$3,047,683.
- Commercial coastal fisheries production of 124 mt, worth US\$314,761.

Ministry of Marine Resources officials (Bertram, pers. com.) estimate the following production for 2000:

- Fresh fish exports: nil
- Pearls: NZ\$18,400,000
- Small-scale commercial fishing:
 - Food fish 80 mt, NZ\$650,000
 - Aquarium fish NZ\$252,000
 - Trochus NZ\$200,000
- Subsistence production: 795 mt

Ministry of Marine Resources (2001) estimates the value of the subsistence fisheries as NZ\$2 million annually.

Passfield (1997) estimates the value of the subsistence fishery of Tongareva as NZ\$500,000 and the export fishery as NZ\$53,000.

Mitchell (2000) gives the catch (tuna, marlin and others) of foreign fishing vessels in the Cook Islands as 688 mt and 295 mt in 1998 and 1999, respectively.

Gillett et al. (2001), using the SPC Catch and Effort Logsheet Database with adjustments, give the foreign tuna catch in the Cook Islands exclusive economic zone (EEZ) in 1999 as:

Table A2.1: Estimated Foreign Tuna Catches in the Cook Islands EEZ, 1999

Fishing Nation	mt
United States of America	197
Korea, Republic of	19
Total	216

EEZ = exclusive economic zone; mt = metric ton.
Source: Gillett et al. (2001).

Anonymous (1998) indicates that during the four-year period 1994–1997, the total catch taken by locally-based longliners was 300 mt, or an annual average of 75 mt.

ADB (2001) states that only one local longliner was operating out of Rarotonga in 2000. In addition, it is stated that the limited amount of fish that is sold in the northern group islands commands around NZ\$2.50–NZ\$3.00 per kg, compared to about NZ\$6.00 per kg in Aitutaki and NZ\$10.00 per kg in Rarotonga.

In summary, by selectively using the above information and the knowledge of recent developments, a crude approximation of the Cook Islands annual fisheries production in the late 1990s is given below:

Table A2.2: Estimated Annual Fisheries Production of Cook Islands, late 1990s

Fishing Sector	Volume (mt)	Value (NZ\$)
Coastal Subsistence	795	2,200,000
Coastal Commercial (including aquarium fish and pearls)	80	19,500,000
Offshore Locally-based	75	750,000
Offshore Foreign-based	300	770,000
Total	1,250	23,220,000

mt = metric ton; NZ\$ = New Zealand dollar.

Fisheries Exports and Imports

Statistics Office (2000a) gives details on exports from the Cook Islands:

Table A2.3: Estimated Annual Value of Fisheries Exports of Cook Islands, 1995–1999 (NZ\$)

Export	1995	1996	1997	1998	1999
Total Exports	6,950,000	4,581,000	4,270,000	6,011,000	6,739,000
Live Fish	169,000	152,000	132,000	214,000	138,000
Fresh or Chilled Fish	1,067,000	250,000	0	0	2,000
Pearls	3,750,000	1,473,000	3,036,000	5,033,000	5,342,000
Pearl Shells	2,000	406,000	225,000	2,000	34,000
Total Marine Exports	4,988,000	2,281,000	3,393,000	5,249,000	5,516,000
Marine Exports as % of Total Exports	71.8	49.8	79.5	87.3	81.9

NZ\$ = New Zealand dollar.
Source: Statistics Office (2000a).

With regard to the pearl exports, the following should be noted:

- Ministry of Marine Resources (2001) indicates that, due to under-reporting, pearl production is more realistically in the order of NZ\$10 million per year.
- ADB (2001) states that pearl production has expanded recently, though the extent of this expansion has been disguised by under-reporting of sales to evade tax and royalty payments.
- Ministry of Marine Resources officials (Bertram, pers. com.) estimated the value of pearl production in 2000 to be about NZ\$18.4 million, the vast majority of which would have been exported.

ADB (2001) comments on recent marine product exports:

- One company is licensed to catch and export aquarium fish. At present, it operates only on Rarotonga, employing five divers and exporting around 20,000 fish valued at NZ\$200,000 per year.

- Pearls represented 90% of total export earnings in 2000, and were more than double those of any year in the past decade. The pearl industry has thus become central to the economic prosperity of the nation, particularly in the north.
- At present, commercial trochus harvests are limited to Aitutaki and Rarotonga (with production of about 25 tons in 2000).

Statistics Office (2000a) gives the total imports of the Cook Islands as NZ\$77,196,000, of which “food and live animals” make up NZ\$18,739,000. The publication does not give specific information for seafood imports.

The Forum Fisheries Agency (FFA 1993) gives “weight and cost insurance freight (CIF) value of imported seafood” for 1990 and 1991. For each of those years, about 30 mt of seafood valued at about NZ\$300,000 was imported. This was about 0.36% of all imports. It should be noted that these values apparently omitted imported canned fish.

Preston (2000), citing the Food and Agriculture Organization of the United Nations (FAO) trade data, states that 195 mt of fishery products were imported in 1995.

Access Fees

Ministry of Marine Resources (2001) indicates that, for the financial year ending June 2000, a total of NZ\$319,478 was received for fishing licenses.

ADB (2001) states that in 2000 there was a reduction in the licensing of distant water fishing vessels in the Cook Islands, with only four Korean longliners licensed in 1999 and none in 2000. Joint ventures with two New Zealand companies operated from 1994 to 1997, while the last French Polynesian longliners ceased fishing in 1998.

Levels of Marine Resource Consumption

Anonymous (2000a) states that Cook Islanders consume, on average, 47.0 kg of seafood per person per year.

Passfield (1997) gives the annual per capita consumption of fish on Tongareva Island as 219.0 kg.

Preston (2000), using 1995 FAO data on production, imports, and exports, estimates the annual per capita fish consumption to be 63.2 kg.

Considering (i) the fisheries production table above which indicates about 950 mt of nonexported seafood production, and (ii) the 195 mt of seafood which FAO estimates as imported annually, the annual seafood consumption could be calculated to be about 71.0 kg for each of the 16,100 Cook Island residents. The tourist situation, however, complicates the situation, and the overseas visitors (in full-time resident equivalents) must be determined in order to estimate per capita seafood consumption accurately.

Exchange Rates

New Zealand dollar (NZ\$) to the US dollar (US\$) as per ADB average-of-period rate:

1995	–	1.5239
1996	–	1.4549
1997	–	1.5124
1998	–	1.8683
1999	–	1.8896
2000	–	2.2012



Federated States of Micronesia

Employment

A total of 10,285 private sector employees were enrolled in the Social Security system in 1997. Of these, 767 individuals (7.4%) were from the fishing sector (Statistics Unit 1999).

Data from the 1994 census and the Statistics Unit (1999) census show:

**Table A2.4: Employment in FSM,
1994 and 1998**

Category	Number of People (1994)	Number of People (1998)
Total Population	105,506	111,536
Population over age 15	59,573	68,377
Population in the Labor Force	25,972	35,033
Employed	21,756	32,254
Formal Workforce	14,381	15,940
Agriculture/Fishing	7,375	16,314
Subsistence Agriculture/Fishing	5,874	10,166
Market-oriented Agriculture/Fishing	1,501	6,148

Sources: National Census (1994); Statistics Unit (1999).

Of the 7,375 people who indicated in the 1994 census that their main activity was farming or fishing:

- 2,022 were primarily involved in fishing (7% female);
- 2,004 were involved in both gardening and fishing (17% female);
- Not included in these numbers were those who farmed and fished and worked part-time in a job/business.

Using the 1994 census data, the total population of the FSM was projected to be 115,045 in 2000 and 117,257 in 2001.

Gillett et al. (2001) estimated employment related to the tuna fisheries in the FSM:

Table A2.5: Employment in Tuna Fisheries in FSM, 1999

Category	No. of People Employed
Foreign Fishing Vessels	150
Domestic Tuna Enterprises	178
Locally-based Longliners and Seiners	86
Artisanal Vessels, Kosrae	25
Artisanal Vessels, Chuuk	100
Artisanal Vessels, Pohnpei	45
Artisanal Vessels, Yap	30
Total	614

Source: Gillett et al. (2001).

Volumes and Values of Fish Harvests

Smith (1992a) stated that in the FSM “the available information on inshore fisheries production is incomplete and often vague.” Dalzell et al. (1996) used information from Smith (1992a) and from the nutrition literature to estimate the coastal fisheries production:

- Subsistence fisheries: 6,243 mt, US\$11,237,400
- Commercial fisheries: 637 mt, US\$1,483,544

Statistics Unit (1999) showed that 490 mt of fish and shellfish worth about US\$1.2 million was “purchased by local fishing markets” in 1997.

The HIES of 1998 showed that US\$18,496,000 was spent by households in the FSM on fresh and frozen fish, the vast majority of which would come from small-scale commercial fishing. Using average fish price information from the Statistics Unit (1999), this equates to 6,323 mt of purchased fish.

Fisheries Engineering (1995) carried out extensive fieldwork in Pohnpei and estimated the total coastal fishery production of Pohnpei Island to be about 1,780 mt (75% reef/inshore, 25% pelagic). This was partitioned as:

- Subsistence catch: 780 mt
- Commercial catch: 1,000 mt (of which about 28% was actually consumed by the commercial fishermen at home)

If the catch level reported in Pohnpei (32% of the FSM population) by the Fisheries Engineering (1995) is extrapolated to all of FSM, the catch by coastal fisheries would be about 5,500 mt. However:

- The per capita catches in the outer islands and in Chuuk are likely to be much higher than in Pohnpei.
- The population of the FSM has increased about 11% in the years since the survey.
- This extrapolation suggests that total FSM present day coastal catches are approximately 8,000 mt per year.

Gillett et al. (2001) indicated that about 2,000 mt of tuna is captured by small-scale coastal fisheries in the FSM. If pelagic catches represent 25% of the fish from small-scale fisheries (as suggested by the Fisheries Engineering study and by individuals knowledgeable in FSM fisheries), then the total catch from small-scale fisheries would be about 8,000 mt.

It is very difficult to make even a rough approximation of the FSM coastal catch of fish and shellfish. Considering the HIES data and the Fisheries Engineering data, it appears that the Dalzell et al. (1996) estimate of commercial production was especially low. In view of the above information and associated likely credibility, a crude indication of the coastal fisheries production would be 10,000 mt, about half subsistence and half commercial. At US\$2.90 per kg for the commercial catch and US\$2.00 per kg for the subsistence catch (30% value reduction being an allowance for getting the product to market [Lewington 2000]), this equates to US\$24.5 million.

For offshore industrial tuna catches, the following has been estimated in Gillett et al. (2001) using a variety of sources:

- During the years 1991–1999, an estimated 1,250,300 tons of tuna were caught in the FSM exclusive economic zone (EEZ). Of this amount, 86.3% was caught by purse seine, 8.8% by longline, and 4.8% by pole-and-line.
- The 1999 provisional Micronesian Fisheries Authority (MFA) figures show a total of 188,029 tons caught in the EEZ—92% by purse seine, 7.5% by longline, and the remainder by pole-and-line. In 1999, the overall catch consisted of 74% skipjack, 20.5% yellowfin, and 4.6% bigeye.

- From 1991–1999, the total amount of longline-caught (sashimi-grade) tuna was 38,836 tons. In 1999 the total amount exported was 1,725 tons.
- The 1999 catches in the FSM were made by the following nationalities:

Table A2.6: Offshore Industrial Tuna Catches in the FSM EEZ, 1999

Fishing Nation	Tuna Catch (tons)
Taipei, China	63,103
Japan	59,708
Korea, Republic of	55,885
Vanuatu	4,900
Federated States of Micronesia	2,499
People’s Republic of China	1,031
United States of America	599
Kiribati	250
Papua New Guinea	54
Total	188,029

EEZ = exclusive economic zone; FSM = Federated States of Micronesia.
 Source: Gillett et al. (2001).

Micronesian Longline Fishing Company officials indicated that the recent FOB price for tuna is about US\$5,000 per mt.

The Micronesian Maritime Authority (MMA 2000) gives the following catch information:

Table A2.7: Estimated Annual Catches of FSM by Fishing Method, 1991–1999 (mt)

Fishing Method	1991	1992	1993	1994	1995	1996	1997	1998	1999
Purse Seine	90,972	109,967	153,716	179,934	159,684	128,786	66,382	71,027	117,829
Longline	9,944	12,645	14,830	15,710	18,639	11,004	9,514	9,163	8,918
Pole and Line	23,405	3,141	6,560	6,280	17,974	998	997	983	280
Total	124,321	125,752	175,106	201,924	196,297	140,788	76,892	81,172	127,027

FSM = Federated States of Micronesia; mt = metric ton.
 Source: Micronesian Maritime Authority (2000).

In summary, selectively using the above information, an estimation of the 1999 total annual fisheries production in the FSM is given below:

Table A2.8: Estimated Annual Fisheries Production of FSM, 1999

Fishing Sector	Volume (mt)	Value (US\$)
Coastal Subsistence	5,000	10,000,000
Coastal Commercial	5,000	14,500,000
Offshore Locally-based	2,499	12,495,000
Offshore Foreign-based	127,000	144,000,000
Total	139,499	180,995,000

FSM = Federated States of Micronesia; mt = metric ton; US\$ = United States dollar.

Fishery Exports and Imports

The official FSM statistics on exports and imports are regarded as being quite unreliable. Nevertheless, the official statistics on exports (Statistics Unit 1999) are presented in Table A2.9:

Table A2.9: Estimated Annual Value of Fisheries Exports of FSM, 1996–1997 (US\$)

Export	1996	1997
Trochus	155,084	0
Fish	9,845,548	4,351,025
Crabs and Lobsters	50,830	269,577
Total Fishery Exports	10,051,462	4,620,602
Total Exports	10,777,986	4,878,387
% Fishery Total Exports	93.3	94.7

FSM = Federated States of Micronesia; US\$ = United States dollar.
Source: Statistics Unit (1999).

Gillett et al. (2001) state that in 1999 the total amount of longline-caught (sashimi-grade) tuna exported from locally-based boats was 1,725 tons. At US\$5,000 per ton, this would equate to US\$8,625,000.

The official statistics (Statistics Unit 1999) show imports of canned fish in the years 1997, 1996 and 1995 were US\$1,730,000, US\$977,000, and US\$1,041,000 respectively. Alternatively, the HIES indicates a retail expenditure of US\$4,429,000 on canned fish in 1998.

The 1987–1998 database of the Convention on the International Trade of Endangered Species (CITES) reports some unauthorized exports of turtles, clams, and corals.

Access Fees

Gillett et al. (2001), using various sources, state that:

- According to records kept by the MFA, the FSM has received over US\$170 million in EEZ access fees paid since 1979 for the rights to fish for tuna.
- In fiscal year 1999, receipts from access fees totaled US\$15.4 million.
- In January 2000, there were seven bilateral and one multilateral foreign fishing agreements in place. In addition, there were nine agreements with domestically-based foreign vessels.
- In addition to the revenue from both foreign- and domestically-based bilateral arrangements, as party to the FFA-administered Multilateral Treaty with the United States, the FSM receives a further estimated US\$110,000 annually that is tied to fisheries development projects.
- An annual payment of goods and services is provided from the Japanese associations as part of the access agreement. In 1999, this was valued by MFA at US\$550,000.
- In fiscal year (FY) 1999 access fees represented an estimated 39% of nontax revenue and 22% of total domestic revenue for the national government.

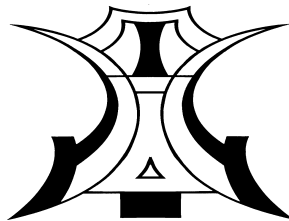
Levels of Marine Resource Consumption

Preston (2000) using 1995 FAO production, import, and export data indicates the annual per capita fish consumption in the FSM as 72.0 kg.

In the above section on FSM fisheries production, it was estimated that the coastal commercial and subsistence production is about 10,000 mt annually. A relatively small portion of this is exported. The offshore locally based tuna vessels caught 2,499 mt in 1999, a relatively small portion of which is consumed in the FSM. If the amount of coastal subsistence and commercial exports is roughly equivalent to the local consumption of the locally based tuna vessels, then the annual per capita consumption of fisheries products is about 87.0 kg. The HIES indicates a retail expenditure of US\$4,429,000 on canned fish in 1998, which roughly equates to 27.0 kg of whole weight of fish per capita per year. Following this logic, the annual per capita consumption of fishery products (both imported and local) in the FSM would be about 114.0 kg. To this figure must be added any fish leakage from the tuna transshipment operations.⁵

Exchange Rates

The FSM uses the US dollar (US\$) as currency.



⁵ In 1999, there were approximately 90,500 mt of tuna transshipped through FSM ports by purse seiners.

Fiji Islands

Employment

The 1996 Annual Employment Survey has recently been updated with 1998 figures. It has estimates of “paid employment” in the “fishing excluding subsistence fishing category:”

Table A2.10: Fisheries-related Employment in Fiji Islands, 1996–1998 (F\$)

Category	1996	1997	1998
Paid Employment in “Fishing excluding Subsistence”	252	173	340
Total Paid Employment	110,081	112,932	112,519
Fisheries Employment as % of Total Employment	0.23	0.15	0.30

Source: 1996 Annual Employment Survey.

Intuitively, the number of jobs appears very low. One fishing company claims 700 staff. Discussions with the Bureau of Statistics officials revealed that the following may contribute to the low estimate:

- The survey used the postal enquiry system in which the questionnaires are mailed out. Large firms (gold mining, garment manufacturing) are more likely to return the forms, or subsequently, respond to government pressure for returning the forms.
- The frame for the survey is based on the business register, and the smaller the firm, the less likely is it to be on the register.
- The survey and follow-up for nonresponse were focused on the larger islands of the Fiji Islands.

If the crew jobs in fishing are taken into account, the 1996 Annual Employment Survey appears to underestimate the fisheries employment in the country by an order of magnitude.

Other sources of fisheries employment information in the Fiji Islands are:

- The Fisheries Division Annual Report 1999 (Fisheries Division 2001) gives the number of crew on registered vessels as 2,304 in 1999, which is about seven times the Employment Survey's total for *all* fisheries employment in the Fiji Islands. Furthermore, the 2,304 people thus employed are only but the crew on the artisanal fishing vessels.
- Gillett et al. (2001) estimate the number of crew on tuna fishing vessels in the Fiji Islands as follows: Foreign fishing vessels, 340; Domestic pole/line vessels, 25; Domestic longline vessels, 462. This totals to 827 jobs.
- An FAO estimate (Visser 1997) shows that, in 1994, there were 64,500 full-time, part-time, or occasional fishers in the Fiji Islands.
- Anonymous (2001a) states that "Total direct employment in the marine sector in 1990 was estimated at 6,500. This increased by 9,570 in 1997. More recent surveys have estimated this to be at 9,000."
- Rawlinson et al. (1993) indicate 8,335 artisanal fishers in the island of Viti Levu.

The 1996 census also gives additional information on employment in the Fiji Islands, as presented in Table A2.11:

Table A2.11: General Employment Information on Fiji Islands, 1996

Category	No. of People
Population 15 years and over	500,913
Economically Inactive	203,143
Economically Active ^a	297,770
Total Work for Money	219,314
Total Subsistence	61,191
Total Unemployed	17,265

^a Economically active is defined as people working for money, engaged in subsistence activities, actively looking for work, or the unemployed in the 1 week before the census night of 15 August 1996. Source: 1996 Annual Employment Survey.

In the 1996 census, there is a general category dealing with fishing employment:

Table A2.12: Fishing Employment in Fiji Islands by Fishing Activity, 1996

Category	No. of People
Total Fishing Employment	6,246
Fishing	5,052
Crabs, Prawns, Kai, Shellfish	1,181
Smoking and Curing Fish	13

Source: 1996 Annual Employment Survey.

The 6,246 jobs above represent about 2.2% of the 280,505 people formally and informally employed in the country.

In addition, the 1996 census shows that, under the manufacturing category, some 1,100 people are employed in “processing fish.”

Volumes and Values of Fish Harvests

The 1998 and 1999 Fisheries Division Annual Reports (Fisheries Division 2000, 2001) give the following catch information:

Table A2.13: Estimated Commercial Fisheries Production of Fiji Islands by Volume, 1995–1999 (mt)

Category	1995	1996	1997	1998	1999
Municipal Market Finfish	590	573	476	481	596
Outlet Finfish	4,108	4,007	3,193	3,701	3,790
Municipal Market Non-finfish	1,537	1,468	1,477	1,660	2,370
Outlet Non-finfish	1,139	680	853	960	1,011
Total	7,374	6,728	5,999	6,802	7,767

mt = metric ton.

Using average price information in the annual reports, the value for the total fisheries catch given in Table A2.13 can be calculated as follows:

Table A2.14: Estimated Commercial Fisheries Production of Fiji Islands by Value, 1995–1999 (F\$)

Item	1995	1996	1997	1998	1999
Coastal Commercial	20,323,200	23,898,600	20,744,970	20,720,980	24,963,900

F\$ = Fiji dollar.

Source: Fisheries Division (2000; 2001).

For the subsistence fisheries, the annual reports give the estimated volume of catch as follows:

Table A2.15: Estimated Subsistence Fisheries Production of Fiji Islands by Volume, 1995–1999 (mt)

Item	1995	1996	1997	1998	1999
Subsistence Fishing	17,000	17,200	17,400	17,600	17,800

mt = metric ton.

Source: Fisheries Division (2000; 2001).

Sources of information on the value of the subsistence catch include:

- Dalzell et al. (1996) give the value of 16,600 mt subsistence fisheries production (early 1990s) as US\$45.8 million.
- World Bank (2000) calculates the value of the Fiji Islands' 18,057 mt of finfish subsistence catch and 7,042 mt of shellfish subsistence catch as US\$3.9 million in caloric value, or US\$6.7 million in protein value.
- Passfield (1994), using a variety of sources, states that recent estimates of the value of the Fiji Islands' subsistence and small-scale commercial sector are around F\$50 million to F\$60 million.
- Anonymous (2001) states that "Recent surveys on the subsistence fishery estimate the sub-sector to be worth \$50 million and supplies 40% of total protein to the community."

Using the "farm gate" system of pricing for subsistence production, which discounts the average fish price by 30% as an allowance for getting the product to market, the nominal 17,800 mt of

production from the subsistence fisheries in 1999 would be worth about US\$40 million dollars.

There are some indications that the statistical system of the Fisheries Division appears to underestimate the catches of the small-scale fisheries. This contention is based on discussions with individuals in charge of the Fisheries Division statistical system on a previous review of that system and on recent developments:

- The Fisheries Division staff involved with the statistical system states that there is good coverage of the 12 municipal markets in Viti Levu and Vanua Levu. In addition to the regular sampling survey, there are other methods (i.e., records kept by market master) to verify the data: (i) good coverage of the tuna exports, (ii) the coverage of the "outlets" is of lower quality, and (iii) there is no coverage of subsistence fisheries.
- "Outlets," which include all places where food is sold outside of municipal markets, are rapidly changing. According to the Fisheries Division, they are covered monthly if there is available staff. Officials of the Fisheries Division stated that outlets are only covered in Viti Levu and Vanua Levu. All catches on the other 78 inhabited islands in the Fiji Islands are considered to be entirely subsistence.
- J. Cook, in a 1986 review of the fisheries statistical system in the Fiji Islands (Cook 1986), indicated that (i) the emphasis on the municipal markets should be reduced and efforts on the outlets should be increased, and (ii) the methodology of the 1979 survey of subsistence fisheries is questionable.
- The Fisheries Division estimates of subsistence catch are based on a 1979 small-scale fishing survey which covered only Viti Levu, and used the ability of a single respondent in each village to recall landings over the previous 12 months. For the past 22 years, the estimate of small-scale production for all of the Fiji Islands (the largest component of the domestic catch) has been made simply by adding 200 mt of fish to the questionable 1979 figure. The results of a small-scale fisheries survey in 1993 (Rawlinson et al. 1993) were not used to modify the 1979 estimate. Also, the results of the 1995 survey of the Northern District were not written up nor used to modify the 1979 estimate. The Rawlinson survey suggested that the small-scale commercial catches in Viti Levu were larger than those estimated by the statistical system.

From the above information, it appears that the production of small-scale fisheries given by the statistical system is probably an underestimate.

For the offshore fisheries, the annual reports give production data for the “local longliners” as follows:

Table A2.16: Estimated Offshore Locally-based Fisheries Production of Fiji Islands by Volume, 1995–1999 (mt)

Item	1995	1996	1997	1998	1999
Offshore Locally-based Fisheries	3,069	4,341	4,157	4,801	5,056

mt = metric ton.

Source: Fisheries Division (2000; 2001).

Tuwai and Lagibalavu (2001) report that:

- The production in 2000 for the 55 local longliners is 5,728 mt.⁶
- The production of the single operating pole-and-line vessel in 1999 and 2000 is 507 mt and 351 mt, respectively.

Gillett et al. (2001) give information on the 1999 catches in the Fiji zone by foreign-based vessels.

Table A2.17: Estimated Offshore Foreign-based Catches in the Fiji Islands EEZ, 1999

Fishing Nation	mt
United States of America	795
Taipei, China	98
Japan	23
Tonga	1
Total	917

EEZ = exclusive economic zone; mt = metric ton.

Source: Gillett et al. (2001).

⁶ During the preparation of the present report, it is understood that SPC made an estimate of the 2000 catch by the locally-based offshore fishery; but the details of the estimation are not yet available.

Using the above information and the contention that the production of the small-scale fisheries given by the statistical system is an underestimate, the following annual fisheries production in 1999 has been estimated:

Table A2.18: Estimated Annual Fisheries Production of Fiji Islands, 1999

Fishing Sector	Volume (mt)	Value (F\$)
Coastal Subsistence	21,600	48,600,000
Coastal Commercial	9,320	30,000,000
Offshore Locally-based	5,500	50,500,000
Offshore Foreign-based	917	1,093,000
Total	37,337	130,193,000

F\$ = Fiji dollar; mt = metric ton.

Fishery Exports and Imports

Using data from the Fiji Islands Revenue and Customs Authority, the Fisheries Division annual reports provide some information on the “export of fishery products.” Reserve Bank (2000) also gives the value of “fish exports.” The data from these two sources are presented in Table A2.19:

Table A2.19: Estimated Annual Fisheries Exports of Fiji Islands, 1997–1999

Fish Exports	1997	1998	1999
From the Fisheries Division			
Volume ^a , mt	16,487	13,978	12,445
Value, F\$	54,314,225	52,764,911	46,277,044
From the Reserve Bank			
Value, F\$	50,400,000	49,500,000	57,500,000

F\$ = Fiji dollar; mt = metric ton.

^a The volume figures do not include exports of live fish, as those are expressed in pieces.

Sources: Fisheries Division (2000; 2001); Reserve Bank (2000).

During a visit to the Fiji Islands on Hazard Analysis at Critical Control Points (HACCP) issues, specialists studied the export

situation in 1997 and concluded that “(i) the various official fish exports statistics which were made available during the visit are erroneous, and (ii) a rough approximation of the total value of Fiji’s food fish exports is around US\$40 million” (Gillett 1997).

It appears that the official Fiji Islands government export statistics may be subject to a number of weaknesses as:

- Many of the main fishery export items stated in the statistics do not even occur in the Fiji Islands. For example, for most years in the 1990s, large amounts of “other salmonids” are listed (i.e., F\$3.6 million exported in 1998).
- Independent estimates of some export commodities are quite different from the official figures. For example, a World Bank report (Icecon 1995) states: “Official Japanese and Korean import statistics from 1992 show that 107.5 tonnes of raw trochus was imported from Fiji, however the official export statistics (Fisheries Division 1993) for raw trochus exports to *all* countries is given as 71 tonnes.”
- There appear to be many incentives to under-report exports.
- According to Bureau of Statistics officials, the 1999 fishery exports of \$46 million seemed low, so the original export documentation was re-examined by the Bureau and the total was recalculated to be \$57 million. The Fisheries Division believes the figure to be closer to \$77 million.

Discussions with the Customs Authority indicate that, because there is no revenue involved, the official recording of fisheries exports is a mere documentation formality.

Using data from the Fiji Islands Revenue and Customs Authority, the Fisheries Division annual reports give the information on the “import of fishery products” as presented in Table A2. 20:

Table A2.20: Estimated Annual Imports of Fishery Products in Fiji Islands, 1997–1999

Fish Import	1997	1998	1999
Volume ^a , mt	17,973	16,854	5,170
Value, F\$	32,659,719	43,921,228	28,174,630

F\$ = Fiji dollar; mt = metric ton.

^a The volume figures do not include exports of live fish, as those are expressed in pieces.

Source: Fisheries Division (2000; 2001).

Access Fees

It is estimated that the Fiji Islands received about US\$212,000 of access fees in 1999.

Levels of Marine Resource Consumption

Fisheries Division (2000) gives consumption per head for 1986–1999 based on the official production data (section above) divided by the Fiji Islands population. The results show:

- 1999—56.0 kg per person per year, of which the subsistence fishery provided 46%
- 1998—47.0 kg per person per year, of which the subsistence fishery provided 51%
- 1997—44.0 kg per person per year, of which the subsistence fishery provided 53%
- 1996—62.0 kg per person per year, of which the subsistence fishery provided 37%
- 1995—58.0 kg per person per year, of which the subsistence fishery provided 39%

Preston (2000) using 1995 FAO production, import, and export information indicated the apparent per capita supply of fish in the Fiji Islands was 50.7 kg per year.

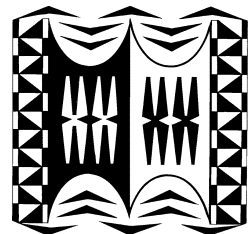
Coyne et al. (1984) state that the Fiji Islands imported 20.2 kg of fish per capita in the 1970s.

World Bank (2000) indicates that seafood represents 23% of animal protein intake in the Fiji Islands.

Exchange Rates

Fiji dollar (F\$) to the US dollar (US\$) as per ADB average-of-period rate:

1995	–	1.4063
1996	–	1.4033
1997	–	1.4437
1998	–	1.9868
1999	–	1.9696
2000	–	2.1286



Kiribati

Employment

Because very few fishermen are registered with the Kiribati Provident Fund, there is little employment information on the fisheries sector (D. Abbott, pers. com.). Most of the indicative information is from the national census held in 1990 and in 1995.

The 1995 census (Statistics Office 1997) shows that:

- Of the 7,848 people who had “cash work,” 349 people (4.4%) had fisheries-related jobs—seaweed grower, coastal fisherman, deepsea fisherman, or other fisheries worker n.e.c.
- Of the 11,920 households in Kiribati, 64% practiced fishing in the ocean flat, 64% in the lagoon flat, 49% in the ocean, and 59% in the lagoon.
- The main source of cash income for 29% of the 11,920 households in Kiribati was fishing.
- The main source of cash income for 9% of the 11,920 households in Kiribati was seaweed cultivation.

Other employment information related to fisheries includes:

- ADB (1998a) states that almost all rural households and about 65% of urban households are engaged in fishing for subsistence purposes. About 1,100 household were engaged in seaweed production in 1996.
- Mees (1987) states that 40–55% of the weekly South Tarawa fish landings of 128 tons are made by full-time commercial fishermen.
- Tebano, T. and G. Paulay (1995) states that, in South Tarawa, 500 subsistence gatherers and 35 commercial divers collect 1,400 mt of the shellfish *Anadara*.
- Preston (2000) estimates fisheries employment in Kiribati in 1996 as 1,131 people employed in commercial harvesting and 20,000 people employed in subsistence fishing.
- Fisheries Division (1998) indicates 12% of the households in Kiribati do not fish. Of those that do fish, 17% fish commercially full time, 22% fish commercially part time, and 61% fish only for subsistence.

- Tinga (2000) states that artisanal fishing is carried out in South Tarawa by 200–300 motorized skiffs.
- Savins (2001) states that (i) there are over 200 boats presently active on Tarawa which employ 300 fishermen full time and 300 fishermen part time, and (ii) people engaged in domestic troll fishing make up 31% of private sector employment in Kiribati.
- B. Onorio (pers. com., August 2001) stated that there are presently no commercially operating pole-and-line or longline vessels based in Kiribati. Although purse seiner *Kao* is registered in Tarawa and has Kiribati crew, it fishes mainly in PNG waters.

Volumes and Values of Fish Harvests

Mees (1987) reports the total catch from Tarawa in 1987 as follows:

- The catch averages 128 mt per week.
- Of the total catch, 32.5% came from ocean fishing, 32.5% from collecting, 28.0% from lagoon fishing, and 7.0% from reef fishing.
- Full-time commercial fishermen are responsible for 40–45% of the catch.

Mees et al. (1988) estimate that the annual catch of all species in the Gilbert Group of Islands were 11,500 mt in the mid-1980s.

The population of Kiribati increased from 64,100 in 1985 to 90,700 in 2000 (Ryan and Stepanoff 2000). If fish catches reported by Mees et al. (1988) increased proportionally, the estimated total catch in 2000 would be 16,271 mt.

Tebano and Paulay (1995) estimate that, for one type of shellfish (*Anadara*) in one lagoon (Tarawa), the yearly catch is 1,400 mt broken down as follows: 9.0 kg per day from each of the estimated 500 subsistence gatherers, and 111.0 kg per day from each of the estimated 35 commercial divers. Some observers of the Tarawa fisheries situation feel that *Anadara* consumption has decreased somewhat in the past few years due to health concerns (M. Savins pers. com., September 2001).

Dalzell et al. (1996), using primarily the 1989 Fisheries Division Annual Report, give the following information on coastal fisheries production:

- Subsistence production of 9,084 mt valued at US\$13,373,667;
- Commercial production of 3,240 mt valued at US\$4,770,000.

The World Bank (2000) estimates the following subsistence production:

- Finfish production of 13,743 mt;
- Shellfish production of 412 mt;
- Total value of subsistence production of finfish and shellfish of US\$7.0 million for equivalent caloric value, US\$18 million for protein equivalent.

Tinga (2000) gives the results of artisanal surveys carried out in 1998 to 2000 on 15 islands in Kiribati:

- Weekly production by artisanal fishermen ranges from 0.5 mt to 20 mt per island, averaging 8 mt per island (equivalent to about 8,800 mt per year for all non-Tarawa islands of Kiribati);
- Weekly artisanal landings of tuna alone at Tarawa is estimated at 33 mt, or about 1,650 mt per year.

The above artisanal production equates to about 10,450 mt per year, excluding Tarawa's non-tuna commercial production.

An individual with long experience in fisheries in Kiribati (M. Savins pers. com., September 2001) provided thoughts on recent fish production and prices:

- Artisanal production. Fish production at the 17 outer islands is about 3 mt per week; production at Christmas Island is about 18 mt per week; and production of tuna at Tarawa is about 26 mt per week.

The above artisanal production equates to about 5,000 mt per year, including Tarawa's non-tuna commercial production.

- Subsistence production. It is estimated to be about twice the artisanal production for each island.
- Prices:
 - Tarawa finfish – A\$2.40–A\$2.62 per kg, average price of A\$2.50 per kg
 - Tarawa *Anadara* – A\$5.00 for a 20.0-kg bag; whole weight to food ratio of 5:1
 - Outer islands finfish – A\$0.3–A\$0.60 per pound, average price of A\$1.00 per kg

B. Onorio (pers. com., August 2001) reports that the Kiribati-flagged purse seine vessel *Kao* is fishing mainly in PNG waters and does three to four trips per year.

Gillett et al. (2001) uses the SPC Catch and Effort Logsheet Database with adjustments to estimate the 1999 tuna catches in the Kiribati zone and catches by Kiribati-flagged vessels in other zones.

Table A2.21: Estimated Foreign Tuna Catches in the Kiribati EEZ, 1999

Fishing Nation	mt
United States of America	56,167
Taipei, China	38,826
Vanuatu	15,060
Korea, Republic of	10,512
Japan	10,199
Federated States of Micronesia	960
Solomon Islands	484
Papua New Guinea	183
Kiribati	0
Total	132,391

EEZ = exclusive economic zone; mt = metric ton.
 Source: Gillett et al. (2001).

Table A2.22: Estimated Catches by Kiribati-flagged Vessels in Other EEZs, 1999

EEZ	mt
Papua New Guinea	4,928
Federated States of Micronesia	250
Nauru	140
Solomon Islands	85
Palau	65
Kiribati	0
Total	5,468

EEZ = exclusive economic zone; mt = metric ton. Source: Gillett et al. (2001).

In summary, selectively using the above information and the knowledge of recent developments, a crude approximation of the Kiribati annual fisheries production in recent years is given below:

Table A2.23: Estimated Annual Fisheries Production of Kiribati, late 1990s

Fishing Sector	Volume (mt)	Value (A\$)
Coastal Subsistence	10,000	12,230,000
Coastal Commercial ^a	6,000	9,780,000
Offshore Locally-based	0	0
Offshore Foreign-based	132,000	205,000,000
Total	148,000	227,010,000

A\$ = Australian dollar; mt = metric ton.

^a Includes the value (but not volume) of aquarium fish.

Fishery Exports and Imports

Table A2.24: Estimated Annual Value of Fisheries Exports of Kiribati, 1995–1999 (A\$)

Export	1995	1996	1997	1998	1999
Fish (Fresh/Frozen)	266,000	211,000	110,000	105,000 ^a	200,000
Pet Fish	817,000	639,000	698,000	716,000	1,800,000
Shark Fins	659,000	194,000	94,000	129,000	300,000
Total Fish/Pet/Shark Exports	1,742,000	1,044,000	902,000	950,000	2,300,000
Total All Exports	10,030,000	6,817,000	8,432,000	9,410,000	13,600,000
Percentage of Fish/Pet/Shark Exports to All Exports (%)	17.4	15.2	10.7	10.1	16.9

A\$ = Australian dollar.

^a NEPO (1990) reports A\$1,047,000 for fish exports for 1998. However, unpublished information from the Statistics Office, Ministry of Finance and Economic Planning (June 2001) only reports A\$105,000. Sources: For 1995–1998 figures: NEPO (1999); For 1999 data: unpublished information, Statistics Office, Ministry of Finance and Economic Planning, June 2001.

Other information relevant to the export of fishery products includes:

- Fisheries Division (1994) states that “there is a high tendency for locals going abroad to take with them fish and other marine products destined for friends and relatives staying abroad. An estimated 11.5 mt of such “personal consignment” was recorded for 1994.
- Fisheries Division (1994) records an export of 139.3 mt of marine products for overseas markets. For the same year, NEPO (1999) records 262 mt of fish alone.
- ADB (1998a) states that fisheries exports peaked at A\$2.73 million in 1989 when exports of the government-owned Te Mautari Limited (TML) reached A\$2.6 million.

With respect to fishery product imports:

- The Overseas Fisheries Cooperation Foundation (OFCF) of Japan (1998) indicates that about 380 mt of seafood, worth about A\$572,840 was imported in 1995. The vast majority of this was canned fish, but A\$18,726 of dried fish from the Marshall Islands and Australia was also imported.
- ADB (1998a) gives total of all Kiribati imports for 1995 as A\$47,547,000; and the total for food imports as A\$15,407,000.
- The Integrated Marine Management Limited (IMM 1993) states that imports of canned fish are about 270 mt per year.
- Nube (1989) gives the Kiribati canned fish imports from 1974 to 1986, which range from 112 mt to 312 mt per year.
- Coyne et al. (1984) state that in the period 1978–1979, 3.2 kg of canned fish per capita was imported.

Access Fees

According to unpublished information from the Statistics Office (June 2001), the Kiribati Government received the following “fish license revenue:”

Government expenditures in 1999 were approximately A\$94.0 million. In recent years, the Kiribati GNP has been about 1.5 to 2.0 times the GDP due to fishing license fees, external assets, and Seamen’s remittances.

Table A2. 25: Estimated Annual Fishing License Revenue of Kiribati, 1996–2000 (A\$)

Item	1996	1997	1998	1999	2000
Fishing License Revenue	6,234,000	29,434,000	40,322,000	31,930,000	31,159,000

A\$ = Australian dollar.
Source: Statistics Office (2001).

Levels of Marine Resource Consumption

The various studies on fish consumption in Kiribati give the following results:

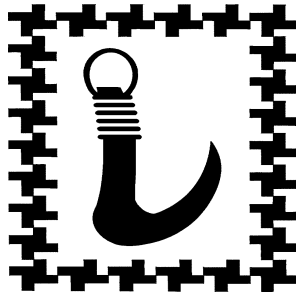
- Fisheries Division (1978) estimates that 335,936 cans of fish are purchased in South Tarawa annually. The annual fresh fish consumption for the 14,824 residents of South Tarawa was estimated to be 113.0 kg per capita.
- Coyne et al. (1984) state that in the period 1978–1979, 3.2 kg of fish per capita was imported.
- Nube (1989) reports that the Kiribati canned fish imports for 1974–1986 range from 112–312 mt per year. Using information from the 1985 census, he estimated daily per capita fish consumption for the 18 islands in the Gilbert and Line groups to range from 0.45 kg in South Tarawa to 2.86 kg in Arorae. Of the 18 islands listed, 11 (61%) of the islands have a per capita consumption of fish greater than 1 kg per day.
- World Bank (1995), quoting FAO sources, stated that “Per capita supplies [of fish] available for consumption are consequently quite high ranging between 72 and 75 kilograms per year over the last decade.”
- World Bank (2000) recounts that in Kiribati 67% of total animal protein is from seafood.
- According to IMM (1993), the estimated catch in the Gilbert Group of Islands translates to a fish annual supply of 207.0 kg per capita.
- Using 1995 FAO production, import, and export data, Preston (2000) calculates that the annual per capita supply of seafood is 150.0 kg.

Considering (i) the Kiribati population of 90,700 in 2000 (Ryan and Stepanoff 2000), (ii) the local fishery production of 16,000 mt (Table A2.23), (iii) fish exports of about 60 mt in the late 1990s (NEPO 1999), (iv) canned fish imports of about 380 mt annually (OFCF 1998) equivalent in food value to about 760 mt of whole fish, it appears that the annual per capita fish consumption in Kiribati in the late 1990s is about 185.0 kg.

Exchange Rates

Australian dollar (A\$) to the US dollar (US\$) as per ADB average-of-period rate:

1995	–	1.3490
1996	–	1.2779
1997	–	1.3474
1998	–	1.5918
1999	–	1.5500
2000	–	1.7250



Marshall Islands

Employment

Employment information from the 1999 Census is presented in Table A2.26:

Table A2.26: Employment in Republic of the Marshall Islands, 1999

Category	Total	Male	Female
Total Marshall Islands Population	50,840	26,026	24,814
Working Age Population (15 years and older)	26,698	14,595	14,103
Economically Active Population (Labor Force)	14,677	9,679	4,998
Employed Population	10,141	7,008	3,133
Employed in Fishing			
Fishermen, deepsea	72	71	1
Fishermen, other deepsea	12	12	0
Fishermen, inland and coastal	170	165	5
Fishermen, n.e.c.	27	27	0
Total Employed in Fishing	281	275	6

Source: Office of Planning and Statistics (2000a; 1999).

The census showed that the 281 people employed in fishing were in the following employment categories: public sector employee (28 people); private sector employee (62); self-employed (179); employer in own business (2); paid worker in family business (3); and unpaid worker in family business (7).

In comparison to the census data, MIMRA staff, when asked to roughly estimate employment in the small-scale commercial coastal fishing only, indicated that about 300 people in the Marshall Islands would have such employment.

Partitioning the above census employment between the monetized sector and the subsistence sector is more difficult. The 10,141 total employed population are broken down in the Statistical Abstract (Office of Planning and Statistics, 2000a; Table 6.27) as follows: 7,221 in the monetized sector; and 2,920 in the subsistence sector (i.e., individuals involved in subsistence activities were considered employed). The 281 individuals employed in fishing would therefore be the total of all commercial and subsistence fishers. Discussions with individuals peripherally associated with the census

and a cautionary note in the Statistical Abstract led to the conclusion that the format of the 1999 census was not especially good for defining the subsistence sector of the Marshall Islands economy.⁷

FAO (1998) estimated that 4,700 individuals are employed in the subsistence fisheries in the Marshall Islands. World Bank (1995) cites the 1988 census and indicates that 12% of subsistence workers considered themselves fishers.

The “employed in fishing” category in Table A2.26 does not include processing or servicing fishing vessels. There are about 280–350 people employed at the new loining plant, with an average wage of US\$2.00 per hour. Gillett et al. (2001) estimate that 20 people serve as laborers for tuna transshipment operations.

Volumes and Values of Fish Harvests

For the small-scale catches in the Marshall Islands, many estimates have been made, several of which have quoted Smith (1992b) as a source of information. Smith stated that “With the exception of the Arno project, the available information on inshore fisheries production is virtually non-existent or old.”

The available information on fisheries production and values for this study includes:

For subsistence fisheries:

- Elsy (undated) states that there is no visible means of assessing the level of subsistence fisheries as no records have been kept.
- World Bank (1995) states that there are no reliable estimates of the degree of exploitation of inshore resources.
- Dalzell et al. (1996) estimates 2,000 mt valued at US\$3,103,213 for the early 1990s.
- Office of Planning and Statistics (1996), for early 1990s, reports 3,185,928 pounds of food weight⁸; approximately 2,800 mt of whole fish weight valued at US\$3,655,848.

⁷ The 1999 Census asked a question about the “business/industry” that respondents were involved in during the previous 7 days, and provided many choices of occupations for which the respondents were to choose one. As most subsistence fishers also have many other occupations, the responses may not have been able to portray the real situation.

⁸ This appears to be the food weight (rather than the whole weight) of fish because the value given in the worksheet (US\$1.45 per pound in Majuro in 1996) considerably exceeds the 2001 MIMRA fish buying price on Majuro of US\$1.25 per pound.

- The Agriculture and Statistics database, “RMI Online,” shows that 1,445 short tons of fish worth US\$2,852,174 production by households for own consumption.

For commercial coastal fisheries:

- King, G. (1997) estimates the annual catches for Majuro as follows:
 - (i) Tuna at 7,000 lb/week, valued at US\$847,000/year;
 - (ii) Reef fish at 850 lb/week, valued at US\$93,500/year;
 - (iii) Marlin at 200 lb/week, valued at US\$11,000/year.
- Dalzell et al. (1996), for early 1990s, reports 369 mt valued at US\$714,504.
- Office of Planning and Statistics (1996), for early 1990s, estimates 75 mt valued at US\$139,357.
- Observations and enquiries during the July 2001 trip to Majuro for this study suggest 444 mt valued at US\$500,000.
- Office of Planning and Statistics (2000a) states that for “pet fish” for 1999 the value was US\$473,000.

For the large-scale commercial fishery catches in the Marshall Islands, the following recent estimates have been made:

<u>Estimate</u>	<u>Period covered</u>	<u>Total Tuna Catch (mt)</u>
MIMRA (2000)	October 1997–September 1998	47,497
MIMRA (2001)	October 1998–September 1999	65,322 (from Table 11) 87,026 (from Table 17)
Gillett et al. (2001)	Calendar year 1999	33,217
Oceanic Fisheries Programme (OFP 1998)	Calendar years 1990–1996	An average of about 13,000 caught each year.
Office of Planning and Statistics (2000a)	Calendar year 1998	2,188
Office of Planning and Statistics (2000a)	Calendar year 1999	2,457

Although considerable annual variation in tuna catches is to be expected as the purse seine fishery moves east and west, into and out of the Marshall Island zone, the catches cited by Office of Planning and Statistics (2000) appear to be somewhat erroneous.

In summary, selectively using the above information and the knowledge of current developments, a crude approximation of the Marshall Islands annual fisheries production in recent years is given below:

Table A2.27: Estimated Annual Fisheries Production of Republic of the Marshall Islands, late 1990s

Fishing Sector	Volume (mt)	Value (US\$)
Coastal Subsistence	2,800	3,836,000
Coastal Commercial ^a	444	973,000
Offshore Locally-based	0	0
Offshore Foreign-based	33,217	50,000,000
Total	36,461	54,809,000

mt = metric ton; US\$ = United States dollar.

^a Includes the "pet fish" fishery valued at US\$473,000, but negligible weight.

Fishery Exports and Imports

The Statistical Abstract of the Office of Planning and Statistics (2000a) gives details on exports from the Marshall Islands:

Table A2. 28: Estimated Annual Value of Fisheries Exports of Republic of the Marshall Islands, 1995–1999 (US\$)

Exports	1995	1996	1997	1998	1999
Total Exports	23,071,000	18,919,000	12,665,000	8,774,000	7,662,000
Pet Fish	349,000	196,000	41,000	306,000	473,000
Trochus	0	0	0	564,000	0
Chilled Fish	12,671,000	13,172,000	11,855,000	0	0
Frozen Fish	0	746,000	564,000	0	0
Shark Fins	0	104	5	89	0
Total Fisheries Exports	13,020,000	14,114,104	12,460,005	870,089	473,000
Fisheries Exports as % of Total Exports	56.4	74.6	98.4	9.9	6.2

Note: Values are in US dollars (US\$) free on board (FOB).

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

For Table A2.28, the following should be noted:

- A tuna loining plant began operation in Majuro in October 1999, but the loins are not listed under tuna exports nor under re-exports in the Statistical Abstract.
- The treatment of transshipped fish is unclear; the frozen fish exports of 1996 and 1997 may have actually been re-exported transshipped fish.
- Handicraft exports often have shell components but are not listed in the above categories of exports.
- There have been reports of harvest of cultured black pearls, but no mention in the table.
- The CITES 1987–1998 database show considerable coral exports in some years, but these are not given in the Statistical Abstract.

The Statistical Abstract gives information on the import of “fish and crustaceans, mollusks, and other aquatic invertebrates:”

Table A2.29: Estimated Annual Value of Fisheries Imports of Republic of the Marshall Islands, 1995–1999 (US\$)

Import	1995	1996	1997	1998	1999
Total Imports	75,055,000	72,553,000	60,995,000	67,329,000	68,935,000
Imports of Fishery Products ^a	543,340	434,709	169,906	445,371	500,190
Fisheries Imports as % of Total Imports	0.7	0.6	0.3	0.7	0.7

Note: Values are in US dollars (US\$) cost insurance freight (CIF).

^a Does not include any fishery products which may be in the category “meat, fish, or crustaceans, or other aquatic invertebrates, or preparations thereof.”

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

Access Fees

MIMRA (2001) gives the following access fee information:

Table A2.30: Estimated Annual Fisheries Access Fees in Republic of the Marshall Islands, 1996–2000 (US\$)

Paying Country	1996	1997	1998	1999	2000
Japan	1,094,000	900,000	1,926,000	3,407,000	3,369,400
USA	1,281,000	168,000	251,600	287,000	176,600
Ting Hong	478,000	565,000	121,000	0	15,000
Taipei, China	0	0	651,600	499,900	506,200
Korea, Rep. of	0	0	874,400	596,700	253,800
Koos	0	0	0	0	86,200
Others	0	0	97,800	192,000	33,600
Total	2,853,000	1,633,000	3,922,400	4,982,699	4,440,800

USA = United States of America; US\$ = United States dollar.

Note: The above figures are for the fiscal years (October to September).

Source: Marshall Islands Marine Resources Authority (MIMRA 2001).

On the other hand, the Office of Planning and Statistics (1999) reports the following fishing rights revenues which are very different from those presented in Table A2. 30:

1996	–	US\$1,610,260
1997	–	US\$1,916,726
1998	–	US\$1,322,996

In the Marshall Islands, access fees amounted to about 25% of government non tax revenue in fiscal year 1992/1993 (World Bank 1995). The recovery in the late 1990s from three years of economic recession was attributed in part to fisheries access fees (ADB 2000a).

Levels of Marine Resource Consumption

Preston (2000), using 1995 FAO production, import, and export information, indicated the apparent per capita supply of fish in the Marshall Island to be 38.9 kg per year.

Japan International Cooperation Agency (JICA 1983) states that the annual consumption of fish per capita on Majuro in the early 1980s was as follows:

- Local fish – 22.8 kg
- Canned fish – 8.6 kg

- Imported frozen fish – 0.3 kg
- Total – 31.7 kg

The Office of Planning and Statistics' worksheet for calculating the fishing component of GDP contains information from an early 1990s household expenditure survey. From that survey, the subsistence fishery contribution to fish consumption in the Marshall Islands can be estimated to be about 59.0 kg per year.

There have been numerous nutrition studies in the Marshall Islands. At least two studies in the 1990s have contained information on fish consumption:

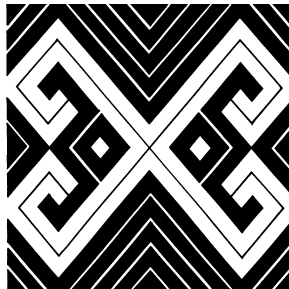
- Johns Hopkins (1992) gave the frequency of eating eight categories of fishery foods in 75 households.
- Burton et al. (1997) gave the average number of meals per week containing local fish and imported fish at Mili, Namu, and Laura.

In examining the fish consumption information in the Marshall Islands, it should be noted that:

- There is considerable difference in consumption between the population centers of Majuro and Kwajalein, where 68% of the population resided in 1999, and the outer islands, where fish is relatively plentiful.
- Leakage of fish from the transshipment operations and longline bases in Majuro is probably having a substantial effect on the supply of fish on that island.

Exchange Rates

The Marshall Islands uses the US dollar (US\$) as currency.



Nauru

Employment

SPC (1994) gives the 1992 population in Nauru as 9,919 people, 6,831 of whom are indigenous Nauruans. In 1992, of the 3,613 people aged 15 years and older, 1,917 were formally employed; 59 otherwise employed; 446 unemployed; and 911 not economically active; with the remainder not stating their activities. According to the census, only two people of the employed population had occupation under the category "Agriculture and related workers," which would presumably include fishery workers.

Ryan and Stepanoff (2000) project the total population of Nauru to reach 11,500 in 2000.

OFCF (1998) reports the ownership and number of fishing vessels as follows:

- Nauruan fishers: 130 powered skiffs; fish are mainly for own consumption with surplus for relatives.
- Non-Nauruan fishers: 88 powered skiffs, 128 one-man canoes; surplus catch sold at landings and to restaurants.

Dalzell et al. (1992) listed the number of nets observed from a circuit of the island: 39 beach seines and 28 cast nets.

NFMRA provided the following information on fisheries-related employment:

- The NFMRA catamaran employs five people full-time.
- Under a system of fisherman registration whereby the registered fishers get a higher price in the market, there are 20 Nauruans and 60 other Pacific Islander fishermen registered.
- Some commercial fishing is carried out by two local businesses.
- It is estimated that there are 100 half-time commercial fishermen, which would be equivalent to 50 full-time fishermen.

Volumes and Values of Fish Harvests

The available information includes Rodwell (1998), which used data collected by NFMRA, indicating that the small troll boats catch

70.0 kg of fish per day and the dropstone boats catch 115.0 kg per day.

Dalzell et al. (1996), citing Dalzell et al. (1992), gave the following catch information:

- Subsistence fisheries: 98 mt worth US\$219,600
- Commercial fisheries: 279 mt worth US\$628,605
- The price was assumed to be US\$2.25 per kg for both the subsistence and commercial landings.

Ryan and Stepanoff (2000), as stated earlier, project the total population of Nauru to be 11,500 in 2000, or an increase of about 13% from the period of the Dalzell et al. (1992) estimate.

Unpublished data of the NFMRA show that 72,275 kg of fish was monitored by the NFMRA numerators between May 1999 and June 2001, but it is unknown what portion of the entire Nauru landings this amount represents.

Mwinoangan, the Nauru fisheries newsletter (NFMRA 1998), gives the following estimates of pelagic catches:

April 1998	– 11.9 mt
May 1998	– 9.5 mt
June 1998	– 14.9 mt
July 1998	– 8.9 mt

Gillett et al. (2001), using the SPC Catch and Effort Logsheet Database with adjustments, give the catches by offshore foreign-based boats in Table A2.31:

Table A2.31: Offshore Foreign-based Catches in the Nauru EEZ, 1999

Fishing Nation	mt
Taipei, China	15,212
Korea, Rep. of	10,465
Japan	6,712
United States of America	6,407
Vanuatu	1,435
Federated States of Micronesia	1,009
Kiribati	140
Solomon Islands	18
Total	41,398

EEZ = exclusive economic zone; mt = metric ton.
Source: Gillett et al. (2001).

NFMRA provided information on fish prices as follows:

- Fresh fish on Nauru sells for A\$3.00–A\$8.00 per kg.
- Tuna sells for A\$4.00–A\$5.00 per kg.
- The average price for all fish sold is about A\$5.50 per kg.

In summary, by selectively using the above information and the knowledge of current developments, a crude approximation of the Nauru annual fisheries production in recent years is presented in Table A2.32:

Table A2.32: Estimated Annual Fisheries Production of Nauru, late 1990s

Fishing Sector	Volume (mt)	Value (A\$)
Coastal Subsistence	110	514,250
Coastal Commercial	315	1,732,500
Offshore Locally-based	50	387,000
Offshore Foreign-based	41,000	57,000,000
Total	41,475	59,633,750

A\$ = Australian dollar; mt = metric ton.

Fishery Exports and Imports

There is little export of fishery products from Nauru.

Dalzell et al. (1992) state that large but unknown quantities of tinned fish are imported into Nauru.

Coyne et al. (1984) indicate that consumption of imported fishery products in Nauru was 5.5 kg per capita in the 1970s. Considering the population of Nauru in 2000, this would presently equate to 63 mt of imported fishery products.

Discussions with officials of NFMRA (P. Jacob, M. Depaune, pers. com., June 2001) provided information on the import/export of fishery products:

- Most of the non canned fishery product imports come from Taipei, China (milkfish) and Australia (salmon, prawns, sardines).

- Imports from Kiribati could be considered semi-commercial as it involves transport as baggage, usually on request from friends in Nauru.
- There is a substantial amount of canned fish in the stores.

Access Fees

It is estimated that Nauru received about US\$3.4 million in access fees in 1999.

Levels of Marine Resource Consumption

Considering the following assumptions:

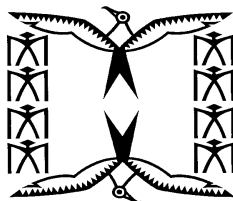
- the Nauru population of 11,500 people in 2000 (Ryan and Stepanoff 2000);
- the subsistence fisheries production of 110 mt;
- the commercial fisheries production of 315 mt;
- the locally-based offshore production of 50 mt; and
- imports of 63 mt.

The annual per capita consumption of fishery products on Nauru can be calculated to be about 46.7 kg.

Exchange Rates

Australian dollar (A\$) to the US dollar (US\$) as per ADB average-of-period rate:

1995	–	1.3490
1996	–	1.2779
1997	–	1.3474
1998	–	1.5918
1999	–	1.5500
2000	–	1.7250



Niue

Employment

Available information on fisheries-related employment includes:

- SPC (1999) states that of the population aged 15 years and older, 49% are in the paid labor force and 22% are in the unpaid labor force. Of the 693 with paid jobs, 28 were classified as “skilled agricultural and fishery workers.”
- In June 2001, Niue had 62 registered boats and about 200 canoes. This suggests there was a minimum of at least 262 people who fish, either commercially or for subsistence, from boats, plus those that dive and fish/gather from shore (B. Pasisi, pers. com., June 2001).
- Dalzell et al. (1993), citing the 1989 agriculture census which surveyed 522 households, indicate that 61% of the households performed some form of fishing activity. Of the 2,934 fishing trips made in September 1989, 39% were from shore, 38% from canoes, 16% from outboard skiffs, with the remainder being diving trips and trips on the government catamaran.
- Dalzell et al. (1993) state that, in July 1990, “only four men on Niue could be truly regarded as full-time fishermen. Two or three other individuals are serious part-time fishermen.”

Volumes and Values of Fish Harvests

Because Niue’s fisheries are not well documented in terms of catch, fishing days, and general fishing activity (Anonymous 2001b), what information that does exist on harvest levels for the coastal fisheries is scattered through several documents, including:

- The 1988–1992 fisheries development plan estimates the fishery production to be between 20 and 50 mt per year.
- McCoy (1990) estimates the total production to be 100–150 mt, about 50% from the reef and 50% from “beyond the reef.”
- Dalzell et al. (1993), using information from an SPC nutrition survey carried out on Niue in 1978, estimate the total catch to be about 115 mt per year, with an additional 4.9 mt per

year exported to New Zealand during periods of direct air connections.

- Dalzell et al. (1996), using reference material from 1990, estimate that the annual production from the subsistence fisheries was 103 mt worth US\$471,504 (or about NZ\$7.64 per kg), and the production from the commercial fisheries was 12 mt worth US\$54,720.
- The Niue Department of Agriculture, Forestry and Fisheries uses the figure of 120 mt as the production from all Niue fisheries (B. Pasisi, pers. com. June 2001).
- During the work to compile the national accounts, a survey of 20 households (3.6% of all households on Niue) was carried out in June 2000. The results of the survey indicated that the annual catch from the subsistence fisheries was about 194 mt, worth NZ\$315,640.

Available information on the offshore fisheries production consists of:

- The SPC Catch and Effort Logsheet Database shows that in 1999 the offshore catch by foreign-based vessels was 2 mt.
- There are no locally-based offshore fishing vessels in Niue.
- Anonymous (2001b) states that no foreign fishing vessels are currently operating in the Niue zone under bilateral licensing arrangements.
- In 15 years of licensing US purse seiners under the multilateral treaty, there has only been one successful set in Niue waters: 27.2 mt of tuna taken in late 1998 (Leolahi 2000).

Some comments should be made on the valuation of the subsistence catch:

- Dalzell et al. (1993) use a value of NZ\$8.0 per kg. This was apparently an average market price for fish on Niue during the survey work in June 1990. The Dalzell et al. (1996) valuation of subsistence fisheries relied on this June 1990 price information.
- Lewington (2000) follows national accounting conventions and values subsistence production based on a price gathered from the local market which is subsequently discounted by 20–30%, being an allowance for getting the product to market. The adjusted prices per kg used in Lewington (2000) are:

<i>wahou</i>	–	NZ\$7.00
skipjack/tuna	–	NZ\$6.00
<i>bonita</i>	–	NZ\$5.00
other ocean fish	–	NZ\$1.20
reef fish (including flyingfish, kaloama)		NZ\$1.20

In summary, by selectively using the above information and the knowledge of current developments, a crude approximation of the Niue annual fisheries production in recent years is presented below:

Table A2.33: Estimated Annual Fisheries Production of Niue, late 1990s

Fishing Sector	Volume (mt)	Value (NZ\$)
Coastal Subsistence	194	315,640
Coastal Commercial	12	96,000
Offshore Locally-based	0	0
Offshore Foreign-based	2	8,000
Total	208	419,640

mt = metric ton; NZ\$ = New Zealand dollar.

Fishery Exports and Imports

There is currently no commercial export of fishery products from Niue. The only fishery exports are those carried by traveling Niueans as baggage (B. Pasisi, pers. com, June 2001). Dalzell et al. (1993) estimate that 5 mt of fish and 2 mt of crabs were exported annually during periods when there was direct air service to New Zealand.

Anonymous (2001b) states that annual imports of fishery products are about 20 mt.

Access Fees

Anonymous (2001b) states that no foreign fishing vessels are currently operating in Niue under bilateral licensing arrangements.

In 1999, under the US multilateral treaty, Niue received US\$151,793.

Levels of Marine Resource Consumption

Dalzell et al. (1993) estimate per capita fish consumption using a 1987 SPC nutrition study. It is estimated that the annual per capita consumption is 40.8 kg food weight, or about 49.0 kg whole fish weight.

Considering (i) the Niue population of 1,900 people in 2000 (Ryan and Stepanoff 2000); (ii) the subsistence fisheries production of 194 mt; (iii) the commercial fisheries production of 12 mt; and (iv) imports of 20 mt, the annual per capita consumption of fishery products on Niue appears to be about 118.9 kg.

Exchange Rates

New Zealand dollar (NZ\$) to the US dollar (US\$) as per ADB average-of-period rate:

1995	–	1.5239
1996	–	1.4549
1997	–	1.5124
1998	–	1.8683
1999	–	1.8896
2000	–	2.2012



Palau

Employment

The 2000 census (Office of Planning and Statistics 2000b) contains only limited fisheries-related employment information:

- 501 people were employed in “forestry and fisheries” at a time when the total number of employed people in Palau was 9,383.
- “Employed” is defined as “at work at all times during the reference week as a paid employee.”
- Persons who did subsistence work, defined as those mainly producing goods for one’s own family, were not classified as employed.

Other fishery-related employment information includes:

- Bank of Hawaii (2000b) states there were 127 “fishing workers” in Palau in 1998. The average annual wage for a fishing worker was US\$4,983, with the average for all Palau occupations being US\$7,687.
- Division of Marine Resources (1995) indicates that there were 107 full-time fishermen, 48 part-time fishermen, and 396 small-time fishermen, for a total 551 commercial fishermen.
- Division of Marine Resources (2001) reports that the number of full-time and part-time commercial fisherfolks totaled 364 in 1995 and 1998.
- Bureau of Women’s Interests (undated), citing the 1995 census, shows that of the 12,144 people in Palau, 511 were occupied full time with subsistence activities (161 of these had at least some involvement with fishing) and 510 had paid work and undertook some subsistence activities (189 of these had at least some involvement with fishing).
- PCS (1999) examined the locally-based tuna industry in Palau and noted that the employment of Palauans in the industry decreased from a peak of about 80 in 1988–1989 to a low of about 5–10 in 1997–1998. The industry also supported the equivalent of about 10 Palauan-filled government jobs.
- PCS (2000) reports that there are 200 commercial and 1,100 non commercial fishers in Palau.

Volumes and Values of Fish Harvests

Preston (1990) gives the total inshore catch (including subsistence) as 1,700 mt.

PCS (2000) examined all available information on the amount of inshore catch in Palau for the years 1989 through 1998. The best estimate of fishery production was made from that information and from individuals familiar with the fishery sector. They concluded that the annual average catch for 1989 to 1998 was 2,115 mt. Given the population increase between the Preston estimate and the mid-point of the period covered by PCS, the two estimates are similar.

Other estimates of coastal fisheries production are:

- Division of Marine Resources (1994) gives the 1992 coastal catch as 750 mt subsistence and 739 mt commercial.
- Division of Marine Resources (1994) gives the 1993 coastal catch as 750 mt subsistence and 575 mt commercial.
- Maiava (1997), citing government reports, states that in 1993 there was a total of 769 tons of fish and invertebrates landings, with a dockside value of US\$2.1 million.
- Division of Marine Resources (2001) gives “commercial fish landings domestic fishery” in 2000 as “920406.899999619” [units unknown].
- Kitalong and Dalzell (1994) examine several estimates of subsistence production in Palau and conclude: “Given the uncertainty surrounding these production estimates, it is probably most realistic to suggest that the subsistence fishery production for Palau may lie somewhere between 500 and 1,100 tons per year.”

According to PCS (2000), the value of coastal commercial production is estimated to be about US\$3.00 per kg, whereas the value of subsistence production is about US\$2.00 per kg.

Division of Marine Resources (2001) gives the total landed catch of locally-based foreign fishing vessels operating offshore:

Table A2.34: Estimated Offshore Locally-based Fisheries Production of Palau, 1995–2000

Item	1995	1996	1997	1998	1999	2000
Sashimi	1,967,462	2,219,720	1,753,323	1,647,759	2,213,910	2,206,955
Cannery	186,400	36,243	86,563	207,870	345,598	315,842
Total	2,153,862	2,255,963	1,839,886	1,855,629	2,559,508	2,522,797

Note: Units not specified.

Source: Division of Marine Resources (2001).

Gillett et al. (2001) use the SPC Catch and Effort Logsheet Database with adjustments to estimate the foreign-based offshore catches in the Palau zone:

Table A2.35: Estimated Offshore Foreign-based Catches in the Palau EEZ, 1999

Fishing Nation	mt
Kiribati	65
Japan	46
Papua New Guinea	13
Total	124

EEZ = exclusive economic zone; mt = metric ton.

Source: Gillett et al. (2001).

PCS (1999) states that “the Japanese distant water fleet landed an annual average of about 120 mt from Palau during the 1993–1997 period, but only about 25 mt in 1997.”

In summary, selectively using the above information, an estimation of the total annual fisheries production in Palau in recent years is presented in Table A2.36:

Table A2.36: Estimated Annual Fisheries Production of Palau, late 1990s

Fishing Sector	Volume (mt)	Value (US\$)
Coastal Subsistence	1,250	2,500,000
Coastal Commercial	865	2,595,000
Offshore Locally-based	2,500	12,500,000
Offshore Foreign-based	124	270,000
Total	4,739	17,865,000

mt = metric ton; US\$ = United States dollar.

Fishery Exports and Imports

PCS (2000) used both the records of imported canned seafood and information from a household survey to estimate fishery imports:

- (i) The import data indicated that an annual average of 610 mt of seafood products was imported over the period 1994–1997;
- (ii) The consumption data suggested that an annual average of 494 mt of seafood products was imported over the period 1989–1998.

FAO (2000a) trade data indicates that Palau imported 415 mt of fish and fishery products in 1997.

PCS (2000) studied the coastal fishery exports of Palau over the period 1989 to 1998 and concluded that an annual average of about 400 mt is exported from Palau.

The Division of Marine Resources (1994) states that 435 mt of coastal fishery products were exported in 1992. It also states that 223 mt of coastal fishery products were exported in 1993 (Division of Marine Resources 1995).

PCS (1999) cites that the average annual exports of Palau's locally-based tuna fleet from 1993 to 1997 were about 2,500 mt. The fleet exported about 1,800 mt in 1997 and probably about the same for 1998.

Office of Planning and Statistics (2000c) indicates that "offshore and reef fish" exports in 1996 were valued at US\$2,213,419.

Access Fees

PCS (1999) gives information on access fees paid by the foreign fleets (1993–1997 averages):

Locally-based:	US\$1,200,000
Japan:	US\$830,000
USA:	US\$260,000
Total:	US\$2,290,000

This amount probably decreased in the late 1990s due to a reduction in the locally-based foreign fleet and movement eastward of the USA fleet.

Levels of Marine Resource Consumption

Various estimates of annual per capita fish consumption in Palau are presented below:

- Perron et al. (1983): 141.0 kg
- Nichols (1991) quotes a 1987 report by Shimada in which the consumption for Koror only was estimated at 26.1 kg.
- Preston (1990): 84.0 kg
- Preston (2000): 85.0 kg
- PCS (2000) estimates (i) local coastal production of 2,115 mt; (ii) fishery product imports of 610 mt; (iii) fishery product exports of 400 mt; (iv) a mean resident population in Palau in the 1990s of 16,600; (e) visitors to Palau (full-time resident equivalents) of 500. This equates to annual per capita fishery product consumption of 135.0 kg.⁹

Exchange Rates

US currency is used in Palau.



⁹ Any consumption due to fish leakage from the locally-based tuna fleet must be added to this figure.

Papua New Guinea

Employment

NSO (1994) contains information relevant to fisheries employment:

- In 1990, the percentage of wage earners to total citizen population was 9.2%.
- For economic activity classification, the census combined farming and fishing in two categories: "Farming/fishing, for food and money" and "Farming/fishing, subsistence only." Thus, the census gives little information specifically on fishing. Similarly, the census gives information on occupations of the urban population under the category "Skilled agricultural and fishery workers."
- Out of 130,963 citizen rural households, about 23% were engaged in catching fish. Of this, about 60% caught fish for own consumption only and 40% caught fish for both own consumption and for selling.

UNDP (1994) has some fisheries-related employment information:

- PNG has about 2,000 coastal villages and a rural coastal population of about 500,000 people.
- The coastal fishing population, defined as those who are involved in some fishing activity at least once per week, totals about 120,000.
- The number of part-time artisanal fishers is between 2,000 and 4,000.

Gillett et al. (2001) estimate tuna-related employment in 2000 as follows:

Cannery:	2,500	people
Loining plant:	15	
Local longliners:	340	
Local purse seiners:	75	
Processing/export:	60	
On-board transshipment:	25	

There appears to be a lack of employment information on the non-tuna commercial fishing operations, such as the fishing for prawns, lobster, barramundi, shark, and aquarium fish.

Volumes and Values of Fish Harvests

Information on the production from coastal subsistence fishing in PNG includes:

- Dalzell et al. (1996), using information from the late 1980s and early 1990s, estimate that PNG's subsistence fisheries annually take 20,588 mt worth US\$41,176,000.
- If the above Dalzell estimate is increased proportionately to population growth, the present production would be about 27,000 mt.
- Preston (1996a), citing several sources, concludes PNG's subsistence fisheries annually take 26,000 mt.
- ANZDEC (1995) assumes the subsistence catch to be worth K1.00 per kg.
- The Acting Director of the National Fisheries Authority (NFA) of PNG indicated that about 26,000 mt of fisheries products, worth from K1.00 to K4.00 per kg is harvested annually by the subsistence fisheries (Batty, pers. com., July 2001).

Information on the production from coastal commercial fishing¹⁰ in PNG includes:

- Dalzell et al. (1996), using information from the late 1980s and early 1990s, estimate that PNG's coastal commercial fisheries annually take 4,966 mt, worth US\$22,096,908.
- Preston (1996a) states that the annual commercial fisheries production in the mid-1990s was about 4,800 mt, worth K16.4 million.
- NFA (1996) indicates that the coastal fishery exports were about K20.8 million in 1995.

Information on the production from the locally-based offshore fisheries in PNG includes:

¹⁰ In this paper, the category includes the prawn and lobster fisheries.

Table A2.37: Estimated Annual Domestic Tuna Catches in PNG by Fishing Method, 1997–1999 (mt)

Fishing Method	1997	1998	1999
Purse Seine	9,286	30,551	25,800
Longline	547	358	650 ^a

mt = metric ton; PNG = Papua New Guinea.

^a Incomplete data.

Source: Kumoru and Polon (2000).

- Kumoru (2001) later updated the 1999 domestic purse seine catch as 26,798 mt.

Table A2.38: Estimated Annual Total Tuna Catches in PNG by Fishing Method, 1997–2000 (mt)

Fishing Method	1997	1998	1999	2000
Purse Seine				
(domestic and foreign)	154,549	128,372	99,984	108,154
Longline	568	393	329	199

mt = metric ton; PNG = Papua New Guinea.

Source: National Fisheries Authority of Papua New Guinea (2001a).

- Gillett et al. (2001), using the SPC Catch and Effort Logsheet Database with adjustments, give the total PNG tuna catch in 1999 as follows:

Table A2.39: Estimated Total Tuna Catch in the PNG EEZ, 1999

Fishing Nation	mt
PNG	49,666
Taipei, China	38,660
United States of America	21,475
Philippines	15,178
Kiribati	4,928
Vanuatu	3,730
Federated States of Micronesia	3,148
Korea, Rep. of	887
Solomon Islands	90
Japan	20
Total	137,782

EEZ = exclusive economic zone; mt = metric ton; PNG = Papua New Guinea.
 Source: Gillett et al. (2001).

In summary, selectively using the above information and the knowledge of recent developments, a crude approximation of the PNG annual marine fisheries production¹¹ in recent years is given below:

Table A2.40: Estimated Annual Marine Fisheries Production of PNG, late 1990s

Fishing Sector	Volume (mt)	Value (K)
Coastal Subsistence	26,000	52,000,000
Coastal Commercial	5,500	55,000,000
Offshore Locally-based	50,500	114,000,000
Offshore Foreign-based	85,000	193,000,000
Total	167,000	414,000,000

K = kina; mt = metric ton; PNG = Papua New Guinea.

¹¹ As the scope of this study is limited to marine resources, freshwater fish catches (estimated by various sources as between 8,000 mt and 13,500 mt per year) are not included.

Fishery Exports and Imports

NFA (2001a) estimates the total exports of marine products as:

Table A2.41: Estimated Annual Total Exports of Marine Products in PNG, 1996–2000

Exports	1996	1997	1998	1999	2000
Volume (mt)	4,476	7,756	39,013	39,896	41,555
Value (US\$)	19,357,615	24,496,044	64,366,729	48,106,666	53,565,923
Value (K)	25,482,050	36,680,018	136,251,074	125,907,747	146,041,687

K = kina; mt = metric ton; PNG = Papua New Guinea; US\$ = United States dollar.
Source: National Fisheries Authority of Papua New Guinea (2001a).

ADB website reports the total exports of PNG as US\$2,639,600,000 in 1999.

NFA (2001b) gives the total annual exports of fish and marine products as:

- 1998 – 38,989 mt valued at K136,754,997 or US\$64,610,172
- 1999 – 32,527 mt valued at K110,173,972 or US\$42,369,824

Kumoru and Polon (2000) report the following *tuna* exports:

Table A2.42: Estimated Annual Tuna Exports of PNG, 1998–1999 (mt)

Tuna Exports	1998	1999
Canned	4,822	6,710
Fish Meal	746	260
Chilled	590	655
Frozen	29,518	28,572

mt = metric ton; PNG = Papua New Guinea.
Source: Kumoru and Polon (2000).

The Acting Director of NFA (Batty, pers. com., August 2001) indicates that about 1,200 mt of tuna were exported by airfreight in 2000.

Lightfoot (2000) estimates the longline exports (tuna and other species) in 1998 as 1,583 mt, worth about US\$3.6 million.

Preston (1996a) states that about 4% by weight of the domestic fisheries production are exported, but this accounts for 25% of the production by value.

ANZDEC (1995) indicates that most of PNG's imported fish (about 95% by volume) is canned fish, principally mackerel. The remainder is frozen fish used in the domestic fast-food business and partly whole mackerel for cannery supply.

Coyne et al. (1984) state that PNG imported 6.1 kg of fish per capita in the 1970s.

NFA (1996) reports that 56,000 mt of canned fish and fillets were imported in 1990.

Preston (2000), using FAO data, estimates that 35,539 mt of fishery products worth US\$43.6 million were imported in 1996.

According to unprocessed data from Customs, 13,473 mt of fishery products were imported in 1998.

Access Fees

NFA (2001b) states that K22,179,578 was received in license fees in 1999. The Acting Director of NFA (Batty, pers. com., August 2001) reveals, however, that the revenue was only about K15 million (US\$5.84 million).

McCoy (1998), in a study of purse seine fishing in PNG, relays that the most recent annual access fees paid (presumably for 1997) were US\$16.4 million.

Levels of Marine Resource Consumption

UNDP (1989) estimates the total consumption of fish (from imported, inland, and coastal sources) by the PNG population in 1988 was approximately 16,350 mt, or roughly about 4.8 kg per capita.

Department of Fisheries and Marine Resources (DFMR 1993) calculates the domestic consumption of fishery products to be about 20.0 kg per capita in 1989.

NFA (1995) assesses that the consumption of fish products in PNG reached approximately 71,000 mt per year, equivalent to about 18.9 kg per capita.

Preston (2000), using FAO imports and exports data, estimates annual fish consumption to be 18.2 kg per capita.

Kumoru (2001) states that about 6,000 mt of tuna is canned annually in PNG for domestic consumption.

Using domestically produced fish consumption information in Preston (1996a), per capita canned fish consumption in FAO (1996), and PNG population figures in NSO (1994), total annual fishery product consumption appeared to be about 24.9 kg per capita in the mid-1990s.

Exchange Rates

PNG kina (K) to the US dollar (US\$) as per ADB average-of-period rate:

1995	–	1.2798
1996	–	1.3191
1997	–	1.4380
1998	–	2.0736
1999	–	2.5708
2000	–	2.7822



Samoa

Employment

Gillett et al. (2001) state that: “Using the most recent estimates of numbers of local longliners and knowledge of the number of crew on various size categories of vessels (Watt, pers. com.), the number of people working on locally-based tuna longliners is estimated to be 455 people.” The tuna processors and exporters presently employ 55 Samoans in Apia. Alternatively, Hand (2001) approximates that 436 Samoans are involved in tuna catching/exporting. To both of these figures, employment in commercial non-tuna fishing must be added.

Fisheries Division officials estimate that about 50 people are employed in bottomfish fishing, 6 people in coral exports, and 12 people in night spearfishing with SCUBA. A total of 500–600 people therefore appear to be formally employed in the fishing sector in Samoa.

An indicator of the total amount of formal employment in Samoa is the 23,009 people who are remitting payments to the National Provident Fund in 1999. The above estimate of 500–600 jobs in fisheries, therefore, represents a substantial amount of the wage paying employment in the country.

Using a broader definition of fishing employment, the 1999 Agriculture census (Department of Statistics and Ministry of Agriculture 2000) reports that:

- One third of the total number of households in Samoa were engaged in some form of fishing during the week prior to the census (or an equivalent of 6,699 households engaged in fishing).
- The total number of people engaged in some form fishing during the week prior to the census was 10,142, of which 8,722 (86%) were males while 1,420 (14%) were females.
- 1% of the households had members who were employed in fishing.
- The disposal of the catch is as follows:
 - Seventy percent of the 6,699 fishing households did not sell any of the catch;

- Of the households that did sell some of their catch, about 30% sold half of their catch, 28% sold about one quarter, 23% sold about three quarters, and 19% sold all their catch.

From the above information, it can be inferred that about 9% of all fishing households in Samoa sell at least half of their catch. If this ratio applies equally to the total number of people engaged in fishing (10,142 people), then about 900 people could be considered commercially oriented fishers. Primarily subsistence fishers would number about 9,200.

Passfield (2001) gives the details of a recent village fisheries study. The study reports that:

- A nationwide household fisheries survey was undertaken in October and November, 2000 to collect subsistence fisheries data and to complete a profile on Samoan village fisheries. The survey covered 1,092 households in 66 villages, out of a total of 21,424 households in 324 villages in all of Samoa.
- Results were given accounting for all Samoan households, and showed that there are 11,700 fishers (82% male; 18% female) living in 8,377 fishing households. A "fisher" was defined as a person who participated in fishing during the period 2 weeks prior to the survey.

Volumes and Values of Fish Harvests

The available information on fishery production and value includes:

- On the basis of a recent survey, Passfield (2001) approximates that 7,169 mt are taken annually by village level fisheries: Of these, 2,876 mt are sold or given away, and 4,293 mt are for home consumption.
- To value the fishery products, Passfield (2001) used an average market price of ST6.29 per kg for both the marketed and non-marketed fishery products.
- Using the system of "farm gate" pricing for subsistence production recommended by SPC (Bains 1996), if the market price of fish is discounted by 20%, being an allowance for getting the

product to market, then the average price for subsistence production would be ST5.03 per kg.

- The total catch (tuna plus by-catch) of the alia catamaran longline fleet was estimated to be about 5,747 tons; 6,072 tons; 5,156 tons; and 5,895 tons in 1997, 1998, 1999 and 2000, respectively (Watt 2001; Sua and Watt 2001).
- Watt (2001) and Watt (pers. com., 2001) reckon the combined value of the 1999 tuna catch (local sales, cannery exports, air freight exports) to be about ST29,748,440.
- Gillett et al. (2001) indicate that, in 1999, 308 mt of tuna was caught by the US purse seine fleet in the Samoa zone.

Selectively using the above information and the knowledge of Samoa fisheries, a crude estimate of annual fisheries production and values for recent years is presented below:

Table A2.43: Estimated Annual Fisheries Production of Samoa, late 1990s

Fishing Sector	Volume (mt)	Value (ST)
Coastal Subsistence	4,293	21,594,000
Coastal Commercial ^a	3,086	19,900,000
Offshore Locally-based	5,156	29,748,440
Offshore Foreign-based	100	300,000
Total	12,635	71,542,440

mt = metric ton; ST = tala.

^a Includes 210 mt (worth T\$1,810,000) of commercial non-tuna exports and all non-commercial fish exports as per export section.

Fishery Exports and Imports

Official export statistics are compiled by Central Bank. Specialized studies undertaken by the Fisheries Division (Watt 2001), using technical insight and industry contacts, portray a different situation:

Table A2.44: Comparison of Samoa's Fisheries Exports from Various Sources, 1996–2000

Source Data	1996	1997	1998	1999	2000
Central Bank	1,180 tons	2,977 tons	4,408 tons	3,786 tons	3,947 tons
<i>All Fish</i>	ST2,287,000	ST12,327,000	ST25,507,000	ST32,605,000	ST24,741,000
Watt (2001)	2,092 tons	4,872 tons	5,072 tons	4,407 tons	4,505 tons
<i>Tuna only</i>	ST13,844,400	ST27,476,400	ST29,581,400	ST27,531,400	ST38,971,000
FAOSTAT database		1,789 tons			
<i>All Fish</i>	—	US\$4,633,000	—	—	—

ST = tala; US\$ = United States dollar.

From Table A2.44, the non-tuna fisheries exports must be added to the *tuna-only* estimates of Watt (2001). The Fisheries Division annual reports give information on this, but as different time periods are covered (the annual reports use the financial year), the extra amounts are not strictly additive. Commercial non-tuna exports and all non commercial fish exports (the export categories not covered by the Central Bank estimates above) of 275 tons worth ST2,230,000 were made in financial year 1998/99, and the 1999/00 exports of 210 tons were worth ST1,810,000.

The above information suggests a need for collaboration between the Central Bank and fisheries experts over fisheries exports as is done by the Treasury Department for calculating the fisheries contribution to GDP.

It also should be noted that the “fish exports” estimated by the Central Bank appear to be entirely finfish, which is somewhat narrower than the range of products produced by the fisheries sector.¹² Officials of the Treasury Department have stated that they are unaware of such non fish exports such as coral. An examination of CITES trade statistics¹³ shows that at least some giant clam and hard coral exports took place for several years. The 1998/99 Fisheries

¹² In addition, under Samoa law, “fish” is any aquatic animal.

¹³ Excel database containing exports listed on Appendices I and II of CITES for the years 1987-1998.

Division Annual Report shows that ST78,873 of “biorock” were exported in 1998/99.

Even if only the official Central Bank finfish exports are considered, this product is the most important export of the country. Unpublished Treasury Department information shows:

Table A2.45: Estimated Annual Value of Fisheries Exports of Samoa, 1996–2000 (ST)

Exports	1996	1997	1998	1999	2000
Fish Exports	2,287,000	12,327,000	25,507,000	32,605,000	24,741,000
All Domestic Exports	24,680,000	37,324,000	48,071,000	53,055,000	44,845,000
Fish Exports as % of					
All Exports	9.3	33.0	53.1	61.5	55.2

ST = tala.

Source: Unpublished, Treasury Department.

World Bank (2000) reports that growth of the Samoa economy in 1999 exceeded expectations, and a key contributor of growth was the export of tuna for canning.

As compared to fishery exports, information on fishery imports is more difficult to obtain.

Passfield (2001) reports that annual canned fish consumption in Samoa is 14.0 kg per capita and that all canned fish is imported in the country. This equates to a total annual import of 2,450 mt of canned fish for the 175,000 residents of Samoa.¹⁴ The only other significant source of fisheries imports are the fresh and frozen products which arrive by ship from Tokelau. In recent years, this has averaged 15 mt per year. Considering this information, the total amount of fishery imports is calculated to be about 2,465 mt per year.

The FAO statistics gives the following information:

¹⁴ Information on the landed and FOB values of this 2,450 mt of canned fish was not available, but the retail cost is ST4.44 per kg (calculated from ST2.00/450 g).

Table A2.46: FAO Statistics on Fisheries Exports and Imports of Samoa, 1997

	Exports (mt)	Exports (US\$)	Imports (mt)	Imports (US\$)
FAOSTAT database, 1997	1,789	4,633,000	106	460,000
FAO (2000b), average of triennium ending 1997	900	1,976,000	4,000	5,065,000

mt = metric ton; US\$ = United States dollar.

Access Fees

It is estimated that in 1999 Samoa received US\$188,616 in license fees. In addition, US\$111,000 was received from the US tuna treaty for project development (Fisheries Division 2000).

Levels of Marine Resource Consumption

Information from various sources on fisheries consumption in Samoa is highlighted in Table A2.47 below:

Table A2.47: Estimates of Fisheries Consumption in Samoa, Various Years

Source	Year for which estimate made	Estimate	Comments
Passfield (2001)	2000	Average per capita consumption of [local] seafood is 57.0 kg per annum, made up of 44.0 kg of fish, and 13.0 kg of invertebrates and seaweed. In addition, canned fish consumption per capita is 14.0 kg per annum; total (local plus imports) is 71.0 kg per capita per year.	Survey was based on respondents' recall of their fishing activities and seafood consumption patterns.

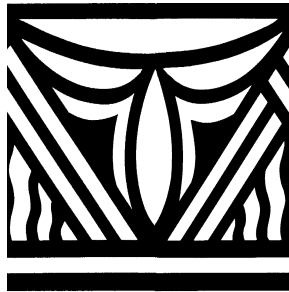
Con't. Table A2.47

Source	Year for which estimate made	Estimate	Comments
Preston (2000)	1995	46.3 kg per capita per year	Based on FAO production, import, and export statistics.
FAO (1993)	1991	Average annual fish consumption was estimated at 36.0 kg per capita in rural households and 19.0 kg per capita in urban households.	

Exchange Rates

Samoan tala (ST) to the US dollar (US\$) as per ADB average-of-period rate:

- 1995 – 2.4757
- 1996 – 2.4590
- 1997 – 2.5701
- 1998 – 2.9574
- 1999 – 3.0231
- 2000 – 3.2864



Solomon Islands

Employment

Unlike the national accounts, there appears to be relatively good employment data in the Solomon Islands. This is largely due to the recent national census in 1999 and a labor market survey in 1998.

Preliminary data from the 1999 national census (Table B6.03) shows:

Table A2.48: Employment in Solomon Islands, 1999

Category	Total in Solomon Islands Economy	People in “Fishing and Related Activities”	Men in “Fishing and Related Activities”	Women in “Fishing and Related Activities”
Population 14 years and over currently active in paid work	57,472	3,367	2,935	432
Population 14 years and over currently active in unpaid work	111,905	5,506 ^a	5,113 ^a	393 ^a
Total	169,377	8,873	8,048	825

^a Main unpaid activity is fishing.
Source: 1999 National Census.

Employment in fish processing is not included in the “fishing and related activities” figures of Table A2. 48 above. The census data shows that 2,861 people had paid work in the “manufacture of meat, fish, fruit, vegetables, oils, and fats,” but no further disaggregation by industry is given.

The 1998 Labour Market Survey (Statistics Office 2000b) shows that 1,412 people (1,356 males and 56 females) were employed in fishing in the private sector and government. The total number of employed people in the Solomon Islands was given as 34,061.

The two studies above gave somewhat different results:

- 3,367 in paid fishing employment out of 57,472 total paid employment in the 1999 census: fishing was therefore responsible for 5.86% of the total paid employment.

- 1,412 employed in fishing out of 34,061 total employed in the 1998 Labour Market Survey: fisheries was therefore responsible for 4.15% of the total people employed.

Gillett et al. (2001) examined the tuna-related employment (both fishing and processing) in the Solomon Islands in 2000. The results of the study are presented in Table A2.49:

Table A2.49: Employment in Tuna-Related Activities in Solomon Islands, 2000

Type of Fishing Employment	Number of People Employed
Local Pole and Line Vessels	750
Local Purse Seine Vessels	135
Local Longliners	240
Cannery	1,450
Sashimi Handling/Processing	40
Artisanal Fishing Vessels	100
Crew on Foreign Fishing Vessels	138
Total	2,853

Source: Gillett et al. (2001).

It was stated that the 2,853 people employed in activities related to tuna represent about 10.8% of all employed people in the Solomon Islands.

An FAO estimate (Visser 1997) shows about 100,000 full-time, part-time, or occasional fishers in the Solomon Islands in the early 1990s.

It should be noted that the four studies cited above largely do not reflect the recent problems caused by the major social unrest in the country.

Volumes and Values of Fish Harvests

There have apparently been no specialized surveys to quantify the production of small-scale fishers in the Solomon Islands. The numerous estimates available use indirect sources to arrive at production figures. These include:

- Cook (1988) states: “Virtually no data have been collected on the artisanal and subsistence fisheries in the past, apart from the irregular reports of fish purchases and sales through the fisheries centers and substations. Current estimates of the artisanal and subsistence production are based on a 1983 estimate of 40.0 kg per capita consumption, giving a national production of 6,000 to 12,000 tonnes.”
- Dalzell et al. (1996), using information from three sources from the early 1990s, estimate annual volumes (and values) of subsistence fisheries to be 10,000 mt (US\$8,405,660) and of coastal commercial production to be 1,150 mt (US\$4,343,811).
- The World Bank (1995), citing Skewes (1990), indicates subsistence production in the Solomon Islands to be 12,690 mt.
- The World Bank (2000) estimates (sources and methods not specified) that subsistence production in the Solomon Islands consists of 8,817 mt of finfish and 4,747 mt of shellfish, for a total of 13,564 mt.
- Gloerfelt-Tarp and Williams (1999) indicate that the country’s subsistence fisheries are in the order of at least 18,000 mt annually.
- Preston et al. (1998) state that “the production of seafood in rural areas was estimated at 9,125 mt annually.” (Note: Both seafood and rural are subsets of larger aggregates of production.)

Preston et al. (1998) contain fish price information for the small-scale fisheries from a variety of sources:

- A 1993 rural household income and expenditure survey calculated that the average value for non marketed fishery products was SI\$2.84 per kg.
- The retail price of fish in Honiara in 1996 ranged from SI\$4.00 to SI\$9.63 per kg.

Fisheries Division (1994) indicates that during the early 1990s the industrial-scale inshore tuna baitfishery took an average of 2,000 mt of fish, worth SI\$2,000,000.

Other sources are used for the estimation of production of large-scale fisheries:

- Fisheries Division unpublished data indicates 73,328 mt for off-shore locally-based vessels and 948 mt for offshore catches in the Solomon Islands zone in 1999 by foreign-based vessels.
- SPC catch and effort logsheet database with adjustments shows a catch in the Solomon Islands zone in 1999 of 73,493 mt for all fleets (local and offshore based).
- Oreihaka (2001) reports that the 1999 tuna catch in the Solomon Islands zone was 47,240 mt, remarkably different from that in the SPC database and in the Fisheries Division's unpublished data.

In summary, selectively using the above information and the knowledge of current developments, a crude approximation of the Solomon Islands annual fisheries production in recent years is given in Table A2.50:

Table A2.50: Estimated Annual Fisheries Production of Solomon Islands, late 1990s

Fishing Sector	Volume (mt)	Value (SI\$)
Coastal Subsistence	13,000	39,000,000
Coastal Commercial ^a	3,200	9,200,000
Offshore Locally-based	73,328	335,000,000
Offshore Foreign-based	948	4,000,000
Total	90,476	387,200,000

mt = metric ton; SI\$ = Solomon Islands dollar.

^a Includes the industrial baitfishery (2,000 mt worth SI\$2,000,000).

Fishery Exports and Imports

The latest official export figures are given in CBSI (2000):

Table A2.51: Official Annual Fisheries Exports of Solomon Islands, 1995–1997

Exports	1995	1996	1997
Frozen Fish	38,944 mt SI\$73,987,000	23,127 mt SI\$50,355,000	26,176 mt SI\$59,490,000
Fish Smoked	846 mt SI\$6,443,000	899 mt SI\$6,134,000	945 mt SI\$6,447,000
Fish Canned	9,914 mt SI\$65,281,000	5,945 mt SI\$48,830,000	7,524 mt SI\$63,882,000
Total Fish	49,704 mt SI\$145,711,000	29,971 mt SI\$105,319,000	34,645 mt SI\$129,819,000
Marine Shells	212 mt SI\$5,568,000	23 mt SI\$330,000	113 mt SI\$2,027,000

mt = metric ton; SI\$ = Solomon Islands dollar.
Source: Central Bank of the Solomon Islands (2000).

According to Table A2.51, the total fisheries exports would appear to be SI\$131,846,000 in 1997. However, there are several categories of fisheries exports besides the four listed by the Central Bank in Table A2.51 above (the “total fish” category is the sum of the previous three categories). Fresh fish (tuna and bottomfish), beche-de-mer, shark fins, and trochus bottom blanks are among the categories not included. IMF (1994) commented that “export data is processed manually by the Statistics Office using a classification system with only about 20 items.”

Gillett (1997), in examining the 1996 fishery exports of the Solomon Islands, stated that:

A scrutiny of official export data shows there are likely to be errors and omissions. There is no category for fresh tuna exports. One company indicated an export of 3,000 mt of fresh tuna which, if correct, would have a annual value approaching SI\$100 million... It is con-

cluded that the official statistics available during the visit to the Solomon Islands underestimate the importance of fish exports from the country.

ADB website gives the 1997 total exports for the country as US\$177,300,000.

Anonymous (2001c) gives chilled fish exports data from 1997 to 2000:

Table A2.52: Estimated Annual Exports of Chilled Fish in Solomon Islands, 1997–2000

Export	1997	1998	1999	2000
Chilled Fish (mt)	2,759	2,152	1,485	816
Chilled Fish (SI\$)	18,150,389	9,604,488	5,648,693	2,918,978

mt = metric ton; SI\$ = Solomon Islands dollar.
Source: Anonymous (2001c).

Anonymous (2001c) also gives information on all fishery exports:

Table A2.53: Estimated Annual Fisheries Exports of Solomon Islands, 1997–2000

Export	1997	1998	1999	2000
Tuna Exports ^a (mt)	37,209	41,157	25,903	816
Tuna Exports (SI\$)	148,477,714	33,013,685	11,165,969	2,918,978
Non-Tuna Fishery Exports (mt)	829	755	722	107
Non-Tuna Fishery Exports (SI\$)	15,325,453	14,371,633	12,918,881	2,813,770
All Fishery Exports (mt)	38,038	41,912	26,625	923
All Fishery Exports (SI\$)	163,803,167	47,385,318	24,084,850	5,732,748

mt = metric ton; SI\$ = Solomon Islands dollar.

^a Includes the categories referred to as frozen, canned, smoked, fishmeal, and chilled.

Source: Anonymous (2001c).

Preston (2000), using FAO trade data, indicates that in 1995 the Solomon Islands imported 107 mt of fishery products. The FAO food balance sheets for 1999 show 81 mt of fishery imports.

Access Fees

ADB (1998b), quoting Fisheries Division sources, states that license fees paid by foreign fishing fleets were SI\$2.8 million in 1991, SI\$3.5 million in 1992, SI\$8.3 million in 1993, SI\$6.89 million in 1994, SI\$6.53 million in 1995, and SI\$1.99 million in 1996.

It is estimated that US\$273,458 was received by the Solomon Islands in 1999 for access under the US tuna treaty and FSM arrangements.

Levels of Marine Resource Consumption

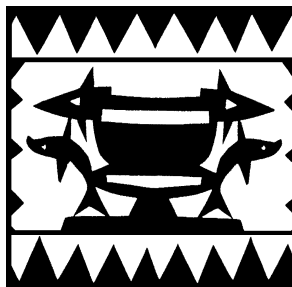
Various estimates of annual per capita fish consumption in the Solomon Islands have been made:

- Cook (1988), citing a 1983 estimate: 40.0 kg
- Skewes (1990), presumably in the late 1980s: 34.6 kg
- Preston (2000) in 1995: 32.7 kg
- The FAO Food Balance Sheet in 1999: 32.2 kg

Exchange Rates

Solomon Islands dollar (SI\$) to the US dollar (US\$) as per ADB average-of-period rate:

1995	–	3.4059
1996	–	3.5664
1997	–	3.7169
1998	–	4.8560
1999	–	4.8381
2000	–	5.1100



Tonga

Employment

According to the Statistics Department (1999a), there are three categories of economic activity: (i) paid employment (full or part-time job), (ii) farming/fishing/handicrafts, and (iii) on leave. Taking the first two categories (only 77 were on leave, sectors unspecified), the following table summarizes the situation:

Table A2.54: Employment in Tonga, 1996

Category	Total in Tongan Economy	Total in Fisheries Sector	Men in Fisheries Sector	Women in Fisheries Sector
Paid Employment	13,318	1,067	1,039	28
Farming/Fishing/Handicrafts	16,011	940	907	33
Total	29,329	2,007	1,946	61

Source: Statistics Department (1999a).

The 940 people in the “farming/fishing/handicrafts” category represent a continuum between subsistence and commercial activity. Statistics Department (1999a) segregates this category into three components: (i) “Own consumption” [254 people], (ii) “Occasionally sell” [448], and (iii) “Regularly sell” [238 people]. If this last component is taken to be non subsistence, then it could be stated that fisheries employment in Tonga in 1996 consisted of 702 people in the subsistence sector, and 1,305 in the non subsistence sector.

The above information was from the most recent national census of Tonga (1996). The methodology is documented in the Statistics Department (1999a).

During a visit to Tonga to collect information for the present study (May 2001), some additional observations on fisheries employment were made. Using information from the fish exporters association, it was estimated that the export-oriented fisheries employ about 215 people.

Volumes and Values of Fish Harvests

The Ministry of Fisheries has no estimate of total coastal/in-shore production, only the volumes and values of the throughput of certain fish markets. Available documents giving information on fishery production and value include:

- Dalzell et al. (1996) states in the early 1990s that subsistence production was 933 mt, worth US\$1,901,208, and that the coastal commercial production was 1,429 mt, worth US\$2,806,641.
- Ryan and Stepanoff (2000) indicate that the population of Tonga has increased about 4% since the period of the Dalzell et al. (1996) estimate above.
- The Statistics Department, using household income and expenditures surveys, has determined that the value added for local market fisheries is T\$9,090,000 and for non market fisheries is T\$5,108,000. Using the value-added ratio of 0.8 and fish values in Vaikona et al. (1997), this equates to:

Non market fisheries	–	2,863 mt, worth T\$6,385,000
Local market fisheries	–	3,561 mt, worth T\$11,362,500
- The Foreign Trade Report indicates that T\$4,116,328 worth of fishery products was exported in 1999.
- The Tonga Fish Exporters Association indicates that about T\$9,000,000 (1,224 mt at T\$7.35 per kg [FOB]) of fresh chilled fish was exported by their members alone in 2000. For the purpose of this calculation, half of this is assigned to coastal fisheries (bottomfish) and half to offshore fisheries (tuna).
- Ministry of Fisheries (2001) details volumes and values of fisheries exports, including:

Aquarium fish and related products	–	T\$1,520,230
Seaweed	–	T\$108,500
- Ministry of Fisheries (1999) indicates that the locally-based offshore fleet produces 700 mt to 900 mt of fish annually.
- Gillett et al. (2001) give the following foreign catches in the Tonga zone in 1999:

Table A2.55: Estimated Offshore Foreign-based Catches in the Tonga EEZ, 1999

Fishing Nation	mt
United States of America	29
Fiji Islands	14
Taipei, China	2
Total	45

EEZ = exclusive economic zone; mt = metric ton.
 Source: Gillett et al. (2001).

Much of the above information is conflicting. Using knowledge of Tonga fisheries, a crude estimate of annual production and values for recent years is given in Table A2.56:

Table A2.56: Estimated Annual Fisheries Production of Tonga, late 1990s

Fishing Sector	Volume (mt)	Value (T\$)
Coastal Subsistence	2,863	6,385,000
Coastal Commercial ^a	4,173	17,362,500
Offshore Locally-based	800	5,880,000
Offshore Foreign-based	45	166,000
Total	7,881	29,793,500

mt = metric ton; T\$ = pa'anga.

^a Includes aquarium fish and related products (value but not volume) and seaweed.

Fishery Exports and Imports

The various estimates of fishery exports and imports are:

Table A2.57: Estimates of Fisheries Exports and Imports of Tonga, Various Sources

Source	Export (mt)	Export (value)	Import (mt)	Import (value)
FAO 1997	209	US\$1,225,000	8	US\$29,000
Reserve Bank 1997		T\$3,100,000		
Reserve Bank 1998		T\$2,400,000		
Reserve Bank 1999		T\$5,900,000		
Ministry of Fisheries 1997		T\$2,402,927		
Ministry of Fisheries 1998		T\$2,080,852		
Ministry of Fisheries 1999		T\$3,004,839		
Ministry of Fisheries 2000		T\$10,346,037		
Tonga Fish Exporters Association ^a 2000		T\$9,000,000		
Foreign Trade Report, 1999	715	T\$4,116,328	712	T\$1,356,980
FAO (2000b) average of triennium ending 1997	300		500	

FAO = Food and Agriculture Organization of the United Nations.

mt = metric ton; T\$ = pa'anga; US\$ = United States dollar.

^a Covers only the finfish exports of the seven companies belonging to the association.

The Reserve Bank and Foreign Trade Report statistics are from declared values on export documentation, where there are incentives on the part of exporters to under-report the figures. The Ministry of Fisheries data is from the permits for export of products, and these are not usually inspected by Ministry officials. The members of the exporters association are under pressure to show the importance of fish exports to the Tonga economy, as the current tax exempt status of fuel may be under jeopardy.

Statistics Department (1999) gives the total exports of the country as T\$17,312,142 in 1999. Hence, the official fishery exports that year, which amounts to T\$4,116,328, represent approximately 23.8% of all exports.

Access Fees

It is estimated that Tonga received US\$152,041 in access fees during 1999.

Levels of Marine Resource Consumption

The 1998 FAO/Australian Agency for International Development (AusAID) Fisheries Sector Review (Gillett et al. 1998) stated that:

“It is difficult to make an accurate assessment of the present level of fish intake in Tonga. Although there was a national nutrition survey in 1986, there have been no national food consumption surveys from which average fish consumption could be derived. The figures published for per capita consumption of fish range from a low of 14.0 kg/year to a high of 102.0 kg/year (implying a production of 10,000 mt). Assuming that all the production from inshore fisheries is eaten domestically, and that the best estimate of this in 1995 was 2,362 mt, then this would provide a supply of 24.2 kg/year for the 1996 population of 97,500. Integrating the 575 mt of imported canned fish gives an overall availability of 30.0 kg/year.”

Preston (2000), using 1995 FAO production import, and export statistics, indicates an “apparent per capita supply of fish” of 25.2 kg per year.

Exchange Rates

Tongan dollar or pa’anga (T\$) to the US dollar (US\$) as per ADB average-of-period rate:

- 1995 – 1.2709
- 1996 – 1.2323
- 1997 – 1.2635
- 1998 – 1.4921
- 1999 – 1.5994
- 2000 – 1.7585



Tuvalu

Employment

The Government of Tuvalu (1992) reports that in 1991 fisheries-related employment was as follows:

Table A2.58: Estimates of Fisheries-Related Employment in Tuvalu, 1991

Category	No. of Men	No. of Women	Total No. of Fisheries Employment	% All Employment in Category
Formal Cash Employment in Fisheries	32	46	78	5.3
Traditional Fisheries Activity for Sale	237	23	260	21.6
Traditional Fisheries Activity for Subsistence	895	37	932	19.6

Source: Government of Tuvalu (1992).

The Household Income and Expenditure Survey 1994 (Ministry of Finance and Economic Planning 1998) shows that 316 persons were reported to get income from fishing. This appears quite similar to the 338 total employed (78 in formal cash employment plus 260 in traditional fisheries for sale) given in Table A2. 58.

Quoting census sources, Commonwealth Secretariat (1994) gave the following information related to employment in 1991:

- Percentage of households who participated in ocean fishing: 63%
- Percentage of households who participated in lagoon fishing: 65%
- Percentage of households who participated in reef fishing: 74%
- Percentage of households who participated in fish drying/salting: 63%
- Percentage of households who sold fresh fish: 10%
- Percentage of households who sold dried/salted fish: 8%

Volumes and Values of Fish Harvests

The following information is available on coastal fisheries production in Tuvalu:

- Patiale and Dallzel (1990) estimate that in 1989 the government fleet caught 20.5 mt of fish near Funafuti and state that private fishermen supply five times this amount to Funafuti, implying an annual Funafuti catch of 123 mt.
- Fisheries Division (1992) gives the total for “all fishing in Tuvalu during 1991” as 530 mt, with a breakdown for catches by the various categories: Fisheries Division, 9 mt; NAFICOT, 7 mt; Funafuti private fishermen, 166 mt; and outer island fishermen, 348 mt.
- Fisheries Division (1993) states that the Fisheries Division’s Research Section has estimated that “roughly 1,460 tons of fish are consumed by Tuvaluans in one year.”¹⁵
- ADB (1994), using 1993 dietary information, estimates the annual Funafuti catch as 300 mt artisanal and 430 mt subsistence.
- Sumner (2001) gives the 2000 landings to NAFICOT by private fishers, NAFICOT fleet, the vessel Manau, and outer island fishing centers as 53.9 mt.
- Dalzell et al. (1996), using FAO, SPC, and unpublished sources from the late 1980s and early 1990s, give the annual subsistence catch as 807 mt worth A\$657,781 and the commercial fisheries production as 120 mt worth A\$97,811.
- Laloni and Belhadjali (1996) state there are no records of fishery landings other than in Funafuti and Vaitupu. The report mentions the problems with the Funafuti data and omits the Vaitupu data.
- SCP (1997)¹⁶ stated that:

¹⁵ From the context, it appears that this amount does not include canned fish. The methodology used appears to overestimate fish consumption.

¹⁶ The project which produced the report had a substantial in-country presence in Tuvalu.

“Little information is available on the landings of fish in Tuvalu. A statistical program was initiated with assistance from SPC in about 1986, but has not been developed. Some surveys have been undertaken on Funafuti, but overall estimates for the country are probably most reliably derived from the 1994 household survey. This indicates consumption in Funafuti of the order of 60.0 kg per capita and on the islands of around 120.0 kg on average, though there is substantial variation between islands. These levels would indicate national landings of the order of 1,000 tonnes of fish.”

If it is assumed that the SCP reference is the most accurate, then a crude estimate for the annual fishery landings 5 years after that estimate was made could be 1,100 mt.

The Household Income and Expenditure Survey 1994 (Ministry of Finance and Economic Planning 1998) shows that A\$402,000 is spent by households in Tuvalu on “fish and other seafood,”¹⁷ and A\$217,000 is earned by the 316 persons who reported income from fishing.

With regard to offshore production in 1999, no such catches are made by locally-based vessels. For foreign-based vessels, Gillett et al. (2001) estimate:

Table A2.59: Estimated Offshore Foreign-based Catches in the Tuvalu EEZ, 1999

Fishing Nation	mt
United States of America	35,989
Japan	4,338
Federated States of Micronesia	109
Solomon Islands	90
Korea, Rep. of	5
Taipei, China	1
Total	40,532

EEZ = exclusive economic zone; mt = metric ton.
Source: Gillett et al. (2001).

¹⁷ From the context, this figure probably includes canned fish.

Lewington (1999) and the associated excel worksheet give the 1998 commercial fish values as follows: A\$2.20 in Funafuti; A\$1.50 in outer island.

In summary, selectively using the above information, the Tuvalu annual fisheries production for recent years could be estimated as:

Table A2.60: Estimated Annual Fisheries Production of Tuvalu, late 1990s

Fishing Sector	Volume (mt)	Value (A\$)
Coastal Subsistence	880	1,443,200
Coastal Commercial	220	440,000
Offshore Locally-based	0	0
Offshore Foreign-based	40,532	58,900,000
Total	41,632	60,783,200

A\$ = Australian dollar; mt = metric ton.

Fishery Exports and Imports

It is assumed that fishery imports are equal to the imports of canned fish.

ADB (1998c) shows data on canned fish imports (FOB). These are presented in Table A2.61:

Table A2.61: Estimated Annual Canned Fish Imports of Tuvalu, 1992–1995

Imports	1992	1993	1994	1995
Canned Fish (A\$, FOB)	1,659	8,718	38,195	6,004

A\$ = Australian dollar; FOB = free on board.
 Source: Asian Development Bank (1998c).

Unpublished Ministry of Finance data shows that canned fish imports in 2000 were estimated to be A\$7,366 (FOB).

The above figures appear to be an underestimate, as they would equate to about one can of fish per resident per year.

Unpublished Ministry of Finance data shows some information on fishery exports,¹⁸ as presented below in Table A2.62:

Table A2.62: Estimated Annual Fisheries Exports of Tuvalu, 1997–2000

Item	1997	1998	1999	2000
Fisheries Exports	US\$12,162	A\$4,580	A\$6,561	0

A\$ = Australian dollar; US\$ = United States dollar.
Source: Unpublished Ministry of Finance data.

ADB website shows the total exports of the country to be about A\$373,000 in 1998.

Access Fees

It is estimated that in 1999 Tuvalu obtained about US\$5.9 million in access fees.

Levels of Marine Resource Consumption

SCP (1997) stated that: “consumption in Funafuti [is] of the order of 60.0 kg per capita and on the [outer] islands of around 120.0 kg [per capita] on average, though there is substantial variation between islands.” According to the Ministry of Finance and Economic Planning (1998), about 36% of the population reside in Funafuti. This suggests an average per capita consumption for all of Tuvalu of 98.4 kg per year, plus that from canned fish. Karim (mid 1990s) states, “Most households in Tuvalu, especially Nui and Vaitupu, rely on imported foods during periods of fish shortages.”

Other information on fish consumption in Tuvalu includes:

- Zann (1980), quoting a 1975 report, indicates that finfish are eaten at most meals while shellfish are rarely eaten.
- Fisheries Division (1994) suggests a per capita consumption of 146.0 kg per year. This apparently does not consider canned fish consumption.

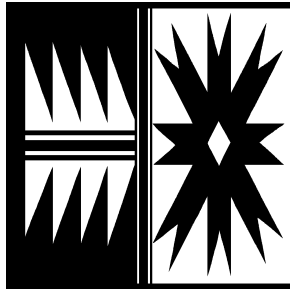
¹⁸ The format of the report may lead to some confusion between US and Australian currency.

- Preston (2000), using 1995 FAO production, import and export statistics, indicates an apparent per capita supply of 85.0 kg per capita per year.
- FAO (2000a), using 1997 fish production and import/export information, gives an annual per capita supply of 23.6 kg.

Exchange Rates

Australian dollar (A\$) to the US dollar (US\$) as per ADB average-of-period rate:

1995 –	1.3490
1996 –	1.2779
1997 –	1.3474
1998 –	1.5918
1999 –	1.5500
2000 –	1.7250



Vanuatu

Employment

Fisheries employment information is not readily available in Vanuatu. Most data quoted in recent reviews of the fisheries sector are from the 1993 National Agriculture Census (Statistics Office 1994). The report of the census includes the following fisheries-relevant employment information:

- About 35% of the 22,000 rural households in Vanuatu were engaged in fishing during the 7 days period prior to the census.
- Of the fishing households above, 40% reported selling fish for some form of income.
- About 19% of rural households collect trochus shell.

ADB (1997), citing the 1989 census, indicates that of the total population of 79,669 aged 15 and over, there were about 66,957 "economically active" people. Of these, 49,810 people were involved in the industry of "Agriculture, hunting, forestry, and fishing." Approximately 45,564 people had occupation as "skilled agriculture and fishery worker." No further disaggregation is available.

Volumes and Values of Fish Harvests

Information on the production of small-scale fisheries includes:

- Statistics Office (1994) states that the 1983 agriculture census estimated that the production of the "village fishing sector" was 2,403 mt per year.
- David and Cillaurren (1992) states that in 1984 the total production for "small-scale unstructured village fishing" amounted to 3,674.5 mt (95% confidence interval: 2,637–4,885 tons).
- If this 3,674.5 mt were increased proportional to the population growth between that period and the present, the present production would be about 5,600 mt.
- World Bank (1995) states that production from "semi-subsistence" operations was estimated at 3,100 mt in 1992.
- Dalzell et al. (1996), using reference material from the late 1980s and early 1990s, estimate that the annual production from the

subsistence fisheries was 2,045 mt worth US\$1,953,360, and the production from the commercial fisheries was 467 mt worth US\$1,514,364.

- Preston (1996b) estimates the coastal commercial production of the bottomfish fishery for each year during the period 1983–1994. In the 1990s, an average of 110 mt per year is calculated.
- Wright (2000) comments on subsistence fisheries: “If 1994 estimates for the size of the subsistence harvest in Vanuatu are reasonable, and the population has grown in line with forecasts, the size of the subsistence harvest in 2000 will be approximately 2,400 tonnes.” Even if this estimate is off by 20%, it still represents a major fishery, in terms of national food security, and provides significant relief in terms of demands for protein substitutes, many of which would be imported.
- Wright (2000) comments on small-scale commercial fishing:
 - (i) Deepwater snapper fisheries provide 80 tons annually to domestic markets, with relatively minor amounts exported. These domestic markets absorb an additional 40 tons of shallow water reef fish and coastal pelagics each year. On the basis that coastal fishermen receive an average price of Vt400 per kg for these fish, the value of these small fisheries to coastal populations throughout the country probably exceeds Vt48 million annually.
 - (ii) On the assumption that collectors of trochus receive an average of Vt250 per kg for the raw shell and that an average of 100 tons of shell has been harvested annually in each of the last 14 years, coastal communities have received an injection of approximately Vt25 million annually from the trochus fishery alone.
 - (iii) It is estimated that other smaller fisheries, principally beche-de-mer, and to a lesser extent aquarium life, green snail and crustacean fisheries, contribute at least an additional Vt15 million to local economies annually, albeit on a more localized scale.
- World Bank (2000) estimates that in 2000 Vanuatu’s subsistence fisheries produced 2,428 mt of finfish and 269 mt of shellfish.

The value of these fisheries was calculated to be US\$8.9 million in caloric equivalent or US\$14.7 million in protein equivalent.

- Fisheries Department (2001) states that the catch by commercial bottomfish boats in 2000 was 34.3 mt, worth Vt21 million.

Local fish prices given in various references include:

- Dalzell et al. (1996), using reference material from the late 1980s and early 1990s, use a value of US\$0.96 per kg for subsistence fisheries and US\$3.24 per kg for the commercial fisheries.
- Anonymous (1997) details the purchases made by a commercial company in several provinces and concludes that an average of Vt312 per kg was paid for the fish, shellfish, and other fishery products purchased.
- Fisheries Department (2000) used an average of Vt320 per kg of fish production to value the production in 1999 of 77 active rural fishing projects.
- Wright (2000) assumes that coastal fishermen receive an average price of Vt400 per kg for market fish.
- Fisheries Department (2001) estimate a value of Vt616 per kg for the 34.3 mt of bottomfish landed by the nine locally-based commercial bottomfish vessels in 2000.

Information on offshore fishing includes:

- Nichols (1996) states that the domestic fishing fleet is limited to two small longliners, which undertake both pelagic and bottom-set longlining for deepwater bottom fish. Other longliners are chartered by two local joint ventures, but these vessels do not base their operations in Vanuatu.
- Anonymous (2000b) states that since December 1997 no locally-based commercial tuna fishing has taken place.
- Fisheries Department (2000, 2001) indicates that four locally-based fishing vessels above 10 meters were licensed in 1999 and nine in 2000. These vessels targeted bottomfish and therefore should not be considered "offshore" vessels.
- Gillett et al. (2001), using the SPC Catch and Effort Logsheet Database with adjustments, give the following tuna catches in the Vanuatu zone:

Table A2.63: Estimated Foreign Tuna Catches in the Vanuatu EEZ, 1999

Fishing Nation	mt
Fiji Islands	65
Taipei, China	53
United States of America	0
Vanuatu	0
Total	118

EEZ = exclusive economic zone; mt = metric ton.

In summary, selectively using the above information and the knowledge of current developments, a crude approximation of the Vanuatu annual fisheries production in recent years is presented in Table A2.64:

Table A2.64: Estimated Annual Fisheries Production of Vanuatu, late 1990s

Fishing Sector	Volume (mt)	Value (Vt)
Coastal Subsistence	2,700	513,000,000
Coastal Commercial	230	88,000,000
Offshore Locally-based	0	0
Offshore Foreign-based	118	32,666,000
Total	3,048	633,666,000

mt = metric ton; Vt = vatu.

Fishery Exports and Imports

Fisheries Department (2001) gives the marine products exports for 2000 in Table A2.65 below.

For earlier years, Wright (2000) indicates that during the 1990s the annual total of all marine exports was about Vt60 million per year.

Table A2.65: Estimated Marine Products Exports of Vanuatu, 2000

Export	Quantity	Value (Vt)
Live Aquarium Fish	8,368 pieces	2,102,931
'Cultured' Coral	275 pieces	161,935
Fresh Poulet	1,193 kg	479,805
Live Rock	13,710 pieces	3,451,648
Live <i>Tridacna Crocea</i>	113,940 pieces	8,511,804
Live <i>Tridacna Maxima</i>	4,825 pieces	901,415
Live <i>Tridacna Squamosa</i>	1,420 pieces	741,148
Processed Beche-de-mer	20,925 kg	3,983,743
Processed Trochus Scraps	42,500 kg	8,846,655
Rock Lobster	975 kg	1,844,700
Semi-processed Trochus Button Blanks	28,690 kg	22,135,750
Shark Fins	30 kg	300,000
Shark Teeth	900 kg	900,000
Total		54,361,534

kg = kilogram; Vt = vatu.

Source: Fisheries Department (2001).

Information on imports of marine products is given in Fisheries Department (2000, 2001). These data are presented below:

Table A2.66: Estimated Marine Products Imports of Vanuatu, 1999–2000

Imports in 1999	Quantity
Mullet	1,000.00 kg
Freshwater Prawns	673.00 kg
King Prawns	250.00 kg
Aquarium Live Fish	291.00 pcs
Various Seafood	370.00 kg
Imports in 2000	Quantity
Prawns (fresh, frozen)	80 kg
Mullet (frozen)	8,020 kg
Live Ornamental Fish (fresh water)	44 pcs
Mussels and Paua (frozen)	15 kg
Reef Fish (fresh)	5 kg
Salted Cod Rod	2 kg
Smoked Cod	5 kg
Billfish Ovaries (frozen)	15 kg
Gracillaria (live specimens)	15 kg

kg = kilogram; pcs = pieces

Source: Fisheries Department (2000; 2001).

The above totals apparently do not include the import of canned fish.

World Bank (1995) estimated that the total value of all fishery products imported in 1993 was US\$735,000.

Preston (2000), using 1995 FAO trade data, indicates that 1,316 mt of fishery products were imported in 1995.

Coyne et al. (1984) estimate the annual per capita import of fish (of which the vast majority was canned fish) to be 14.8 kg in the period 1972–1976.

ADB website indicates the total exports of the country were US\$88.3 million in 1999.

Access Fees

Fisheries Department (2000) states that, in 1999, the Department licensed a total of 14 foreign fishing vessels, which were mainly Taipei, China long-liners. A total of US\$70,000 was collected as government revenue from licenses at US\$5,000 per vessel per year.

It is estimated that Vanuatu received payments of US\$148,448 for access by vessels from the United States under the multilateral treaty.

Levels of Marine Resource Consumption

Preston (1996b) estimates annual per capita fish supply from coastal fisheries in Vanuatu as 15.9 kg.

Coyne et al. (1984) estimate the per capita import of fish as 14.8 kg per capita in the period 1972 to 1976.

Preston (2000), using 1995 FAO data and considering production, imports, and exports, estimates the annual per capita supply as 21.0 kg.

Considering (i) the Vanuatu population of 199,800 in 2000; (ii) subsistence and commercial production of 2,930 mt; (iii) exports of about 100 mt of the subsistence and commercial production; and (iv) fishery imports of about 1,300 mt¹⁹, the annual per capita consumption of fishery products in 2000 would appear to be about 25.7 kg.

¹⁹ It is unknown what portion of this is canned, which would result in a higher whole weight equivalent.

Exchange Rates

Vatu (Vt) to the US dollar (US\$) as per ADB average-of-period rate:

1995	–	112.11
1996	–	111.72
1997	–	115.87
1998	–	127.52
1999	–	129.07
2000	–	137.64



About the Authors

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Robert Gillett, a director of Gillett, Preston and Associates (gillett@is.com.fj), has been involved in marine resources development in the Pacific Islands over the past three decades. He has also worked for several regional and international organizations active in the marine sector, including the South Pacific Commission, the Forum Fisheries Agency, and the Food and Agriculture Organisation of the United Nations. Mr. Gillett has authored over 150 publications and technical reports on fisheries in the region.

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