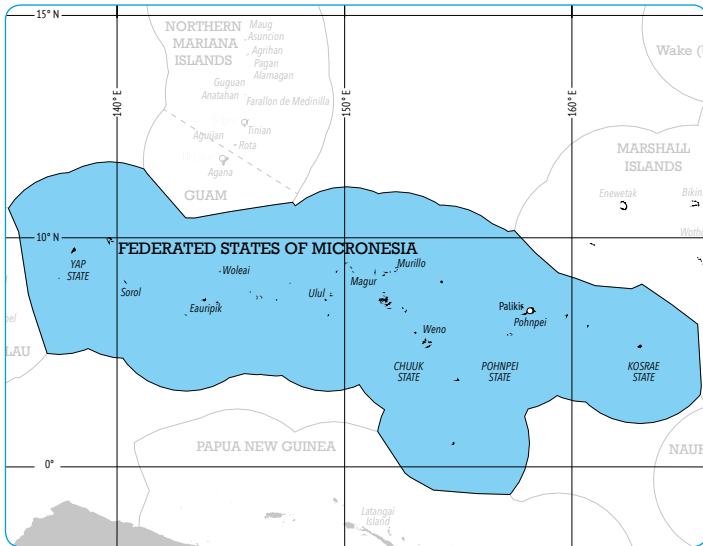


# 7 Federated States of Micronesia



## 7.1 Volumes and Values of Fish Harvests in Federated States of Micronesia (FSM)

### Coastal Commercial Catches in FSM

The following are the major historical attempts to consolidate information on coastal fisheries production in Federated States of Micronesia in recent years:

- Smith (1992) reviewed the FSM fishery resources for the Forum Fisheries Agency. He concluded that in FSM, “the available information on inshore fisheries production is incomplete and often vague.”
- Dalzell et al. (1996) used information from the FFA fisheries profiles (Smith 1992) and from a nutritional survey in 1987/88 (Elymore et al.

1989) to estimate coastal commercial fisheries production for the early 1990s of 637 mt (worth US\$1.5 million), and subsistence production of 6,243 mt (worth US\$11.2 million).

- Gillett and Lightfoot (2001) considered the Dalzell estimate and four other sources of information, and then proposed coastal commercial fisheries production for the late 1990s of 5,000 mt (worth US\$14.5 million) and subsistence production of 5,000 mt (worth US\$10 million).
- Kronen et al. (2009) were more conservative in their approach: “Due to the various methods used to estimate inshore fish (especially reef fish) production figures, and the uncertainties associated with the data collection, an estimate of inshore fish production for the whole of FSM is not possible.”

A study of fisheries production in 2008 (Gillett 2009) examined the above studies and considered other information, including the following:

- A fisheries survey in Pohnpei covering the period 1998–2008 (Rhodes and Tupper 2007, and Rhodes 2008)
- A follow-up on the Rhodes study (George 2008)
- The results of the 2005 FSM household income and expenditure survey
- Comments and feedback on the Gillett and Lightfoot (2001) estimate
- Official and non-official export data
- Changes in the FSM population structure

The Gillett (2009) study states that the available information is totally inadequate for making even a rough estimate of coastal fisheries production in FSM. Nevertheless, with the “obviously weak methodology”, the study ventured a very rough estimate for annual coastal commercial fisheries production in FSM for the mid-2000s of about 2,800 mt (worth US\$7.6 million to fishers), and annual coastal subsistence fisheries production of about 9,800 mt (worth US\$15.7 million to fishers).

Since 2008 some additional documentation on coastal fisheries in FSM has become available, including the following:

- Hopkins and Rhodes (2010) indicate that Pohnpei is currently extracting nearly 725 mt annually from reefs, with about 500 mt of coral reef fish from commercial fishing and 227 mt from subsistence fishing. They state: “A roughly equal share of reef fish was obtained by being

caught (27%), bought (35%) or given to them (33%). Only 5% of households indicated they had obtained fish through barter or trade.”

- Rhodes, et al. (2011) state that there are about 521 mt of locally marketed reef fish annually in Pohnpei and 60 mt in Yap.
- Cuetos-Bueno (2014) indicates about 1 million pounds (453 mt) of reef fish is being caught for commercial purposes in Chuuk lagoon each year, with half being sold at Weno’s urban markets and half being exported.
- OFA (2015) states that in FY 2014 catches of reef fish in Pohnpei were 95.7 mt and catches of pelagic fish were 44 mt.
- Rhodes et al. (2015) states that Pohnpei and surrounding atolls have a finfish yield of about 4,068 mt per year.
- SPC’s PRISM website data shows that the population of FSM decreased 1.8% between 2007 and 2014.
- Several studies point to a decline in recent years in the accessible fisheries resources of FSM (e.g. Kostka and Gavitt 2006, CCIF 2013, Cuetos-Bueno 2014, Rhodes et al. 2015).

In November 2015 another type of information became available to the present study. In 2013/2014 a household income and expenditure survey was carried out in FSM (Statistics Division 2014). The 2013/2014 FSM HIES was more fisheries-oriented than previous HIES work in FSM and other Pacific Island countries (Box 7-1).

#### Box 7-1: Improved HIES for Fisheries Purposes

In 2013 SPC’s Statistics for Development Division made major changes to the type of household income and expenditure survey it promotes in the Pacific Islands region. The new type of HIES is standardised across the countries in the region with respect to the questions asked, sampling methodology, data set, outputs, and reporting. Another feature of the new type of HIES is that the survey is more fisheries-relevant, especially for subsistence and small-scale commercial activities. It is easier to capture home production and household income from fisheries and to disaggregate by various types of catch (i.e. ocean fish, lagoon fish, invertebrates). Since 2013 the new type of HIES has been used in FSM, Nauru and Palau.

Source: M. Sharp, SPC (per. com. November 2015)

In November 2015 staff of SPC's Statistics for Development Division, with permission from FSM's Statistics Division, carried out additional analysis on the data from the recent FSM HIES. This resulted in estimates of cash expenditure by households on various types of coastal fishery products, and imputed a value of coastal fishery products acquired through subsistence activities.

By taking market prices in the four FSM states for various categories of fish prices (kindly supplied by the Statistics Division), the HIES-generated fish values, above, could conceivably be converted into volumes of coastal fish consumed domestically (Table 7-1). However, numerous (possibly tenuous) assumptions must be made for this conversion, so the results must be viewed with some degree of scepticism. Proceeding with this methodology is justified by the lack of alternatives.

Table 7-1: HIES Estimates of Domestically Consumed Coastal Fishery Products (mt)

|            | Yap  |          | Chuuk |          | Pohnpei |          | Kosrae |          |
|------------|------|----------|-------|----------|---------|----------|--------|----------|
|            | Cash | Non-cash | Cash  | Non-cash | Cash    | Non-cash | Cash   | Non-cash |
| Ocean fish | 78   | 127      | 251   | 197      | 219     | 68       | 13     | 213      |
| Reef fish  | 64   | 831      | 232   | 1,241    | 368     | 499      | 54     | 125      |
| Invert     | 2    | 50       | 8     | 83       | 5       | 111      | 5      | 10       |

Source: HIES unpublished data

The FSM coastal fisheries production from the 2013/2014 HIES data, above, can be summed across the four states and types of fishery products. This is given in Table 7-2.

Table 7-2: FSM Coastal Production from HIES Data

|               | Volume (mt)  |
|---------------|--------------|
| Ocean fish    | 1,166        |
| Reef fish     | 3,414        |
| Invertebrates | 274          |
| <b>Total</b>  | <b>4,854</b> |

Some comment is required on the 2013/2014 HIES results. An important issue in the HIES data is that the cash purchases in Chuuk of ocean fish seem large. A researcher from the University of Guam, who spent most of 2014 in Chuuk monitoring fish catches, indicated that ocean fish catches in Chuuk Lagoon are likely to have been less than 100 mt during 2014 (J. Cuetos-Bueno, per. com. November 2015). A fisheries specialist with

long historical involvement with Chuuk fisheries supplied some additional information on the issue:

The major market is the population center of Moen (Weno) where most of the money is and although there are many outboards in Chuuk lagoon, due to the large size of the lagoon and high cost of fuel, travel to chase skipjack would not appear to be economically feasible year-round. During my visit in early 2014 I did not see or hear of any ongoing FAD program that might have a positive influence on catch volumes. Chuuk small boat fishermen do not use artisanal pole-and-line techniques, and thus I would not expect production from outboards in Chuuk lagoon to reach volumes caught on Maina Banks and marketed in Tarawa for example. There has been no purse seine transshipment for years in Chuuk lagoon. Although there are several former Japanese longliners present in Chuuk, these are operated as passenger/cargo vessels and I believe their export from Japan required them to not be outfitted for fishing or carry fishing gear. (M. McCoy, per. com. November 2015)

By contrast, the Chuuk commercial reef fish catches from the HIES data are close to the results obtained from a fishery study. Preliminary results from a study of fishery production in Chuuk Lagoon suggest a commercial catch of about 453 mt<sup>1</sup> of reef fish, about half of which is exported (Cuetos-Bueno 2014) – therefore 226 mt would be available for domestic consumption and be included in the HIES. The HIES generated amount for Chuuk State was very close to that amount: 232 mt.

The HIES implies that Chuuk State catches 41% of the FSM coastal fishery catch that is domestically consumed, while Chuuk represents 47% of FSM's population, according to the 2010 census. Census information may also help reconcile at least part of the discrepancy in the Chuuk tuna catches between the Cuetos-Bueno work and the HIES. The HIES showed over twice the amount of commercial tuna in Chuuk State as that shown by Cuetos-Bueno in Chuuk Lagoon. The census shows that the population of Chuuk Lagoon is 36,152, and the population of the outer islands is 12,502. FAO studies on small-scale tuna fishing in the world (Gillett 2005, Gillett 2011) indicated relatively high catches of tuna by small-scale fishing in the outer islands of FSM. Accordingly, Chuuk State is likely to produce significantly more tuna than Chuuk Lagoon alone.

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<sup>1</sup> Subsequent communication with the author indicates it is likely to have peaked at that amount some years back, due to the ongoing collapse of exports. The non-exported catch (i.e. that reported in the HIES) is likely to have remained the same.

Some observations can be made about the results of the fisheries studies cited above and the 2013/2014 HIES:

- Some ground truthing of the 2013/2014 FSM HIES showed very good concurrence with respect to Chuuk's commercial catch of reef fish, whereas the HIES suggested a larger tuna catch.
- The estimates by Fisheries and Aquaculture (OFA 2015) of the coastal catches in Pohnpei seem very low relative to the other studies, and several researchers are sceptical of those results.
- The available information from the fisheries studies during the last decade do not contribute much additional information on the level of catches in the FSM outer islands, and contribute only a limited amount of information on the FSM subsistence fisheries away from Pohnpei.
- The fishery studies seem to be focused on reef fish, and do not appear to include pelagic fish caught by small-scale fishers (which are considered as part of coastal fisheries in the present study).

Few definitive conclusions can be made on national coastal fisheries production from the above (often conflicting) information. However, making a reasonably informed but crude estimate of the production level may encourage others to produce better estimates. Accordingly, the following can assist in estimating coastal fisheries production of FSM:

- Pohnpei and nearby atolls (i.e. Ant, Pakin) seem to be the only major location where results of FSM fisheries studies are available that cover both commercial and subsistence fisheries.
- The population of Pohnpei is about one-third that of FSM.

There appear to be two divergent possibilities for estimating FSM's annual coastal fishery production:

1. Expanding the Pohnpei coastal fisheries production by that state's share of the population to arrive at the national production is not a robust methodology for many reasons – however applying this method with the Rhodes et al. (2005) results gives a national production of 12,270 mt of reef fish (i.e. 8,589 mt commercial, 3,681 mt subsistence). These figures do not consider ocean fish and exports.
2. Using the 2013/2014 HIES data will result in an estimate of 4,854 mt of domestically consumed coastal fishery products (i.e. 1,299 mt commercial, 3,555 mt of subsistence). These figures do not consider exports.

There is little fisheries information available to enable a choice between the two above approaches. The assumption that the Pohnpei situation is typical of the entire country (possibility #1 above) appears dubious, yet this assumption would be necessary in the approach. Accordingly, possibility #2 will be used here.

The volume of the subsistence catch in the HIES is similar to that of the subsistence catch by the Pohnpei expansion approach. Also, as discussed above, the HIES gave an amount for non-exported reef fish in Chuuk very close to what the University of Guam researcher obtained. These two observations add to the credibility of the HIES results, and to the estimates of coastal fisheries production in the present study.

The HIES coastal fishery production amounts need to be adjusted to account for exports:

- Unpublished export data from the Statistics Division show that an annual average of 165 mt of coastal products (reef fish, crab/lobster and trochus) were exported over the period 2012–2014.
- Rhodes et al. (2011) show reef fish exports from the FSM states, derived from a variety of studies. Those total about 261 mt annually.

Adjusting the 2013/2014 HIES data for exports results in a 2014 coastal fisheries production of 5,280 mt (1,725 mt commercial, 3,555 mt subsistence). Using the HIES prices discounted to be prices to fishers results in a value of US\$5.0 million for the commercial catch and US\$8.8 million for the subsistence catch.

These estimates for 2014 are less than those of the Gillett (2009) study: 2,800 mt commercial and 9,800 mt subsistence. The much smaller amount for subsistence fishing in 2014 is likely to be due to improved information from the 2013/2014 HIES, rather than due to a major change in the fishery.

### Coastal Subsistence Catches

Following from the above section, a crude estimate of the coastal subsistence catch of FSM is 3,337 mt, worth US\$6.1 million to fishers. The fact that the two approaches for estimating FSM fisheries production cited above give similar results for subsistence catches adds some credibility to this estimate.

## Locally Based Offshore Catches

To use the data available to the present study to estimate the catches by FSM-based offshore vessels requires the assumption that all FSM purse seiners are locally based. The volumes and values of FSM-based offshore fishing can be calculated using tuna catches given in Graduate School (2015), sourced from NORMA and tuna prices from the Forum Fisheries Agency (Table 7-3).

**Table 7-3:** Volumes and Value of FSM-based Offshore Fishing

|   | 2012       | 2013       | 2014       |
|---|------------|------------|------------|
| Tuna volume locally based longliners (mt)                                   | 1,577      | 1,936      | 2,763      |
| Tuna volume FSM purse seiners (mt)  | 36,233     | 24,182     | 38,075     |
| Value of locally based longliners adjusted for transport and bycatch (US\$) | 12,852,550 | 15,778,400 | 22,518,450 |
| Value of locally based purse seiners catch adjusted for transport (US\$)    | 59,784,450 | 39,900,300 | 62,823,750 |
| Total volume locally based purse seiners and longliners (US\$)              | 37,810     | 26,118     | 40,838     |
| Total value locally based purse seiners and longliners (US\$)               | 72,637,000 | 55,678,700 | 85,342,200 |

Prices from FFA (2015)

Source: Tuna volumes from Graduate School (2015) and NORMA (unpublished data)

## Foreign-Based Offshore Catches

To use the data available to the present study to estimate the foreign-based catches in the FSM zone requires the assumption that all the catches by FSM-based longliners (given above) are made in the FSM zone. The foreign-based offshore catches can be calculated using tuna catches and prices in FFA (2015), in conjunction with the catches of FSM-based offshore fishing from the above section (Table 7-4).



**Table 7-4:** Foreign-Based Offshore Catches in the FSM Zone

|  | 2012        | 2013        | 2014        |
|--|-------------|-------------|-------------|
| All purse seine in FSM zone (mt)   | 185,916     | 210,453     | 135,871     |
| FSM purse seine in FSM zone (mt)   | 11,047      | 8,557       | 15,981      |
| Foreign-based purse seine in FSM zone (mt)                               | 174,868     | 201,895     | 119,891     |
| All longline in FSM zone (mt)  | 3,297       | 2,984       | 6,179       |
| Locally based longline in FSM zone (mt)                                  | 1,577       | 1,936       | 2,763       |
| Foreign-based longline in FSM zone (mt)                                  | 1,720       | 1,048       | 3,416       |
| Volume pole-and-line catch in FSM zone (mt)                              | 2,489       | 2,337       | 1,175       |
| Value of foreign-based purse seine adjusted for delivery (US\$)          | 288,533,018 | 333,126,902 | 197,819,746 |
| Value of foreign-based longline adjusted for delivery and bycatch (US\$) | 14,018,176  | 8,542,660   | 27,837,513  |
| Value pole-and-line catch in FSM zone adjusted for delivery (US\$)       | 7,001,586   | 4,745,475   | 2,490,821   |
| Volume all foreign-based fishing in FSM zone (mt)                        | 179,077     | 205,280     | 124,481     |
| Value all foreign-based fishing in FSM zone (mt)                         | 309,552,781 | 346,415,036 | 228,148,080 |

Source: FFA (2015) and the preceding section

## Freshwater Catches

The larger islands in FSM have freshwater streams and ponds in which freshwater fish and invertebrates are found, including eels, tilapia and freshwater shrimp. The capture of eels is not large due to cultural attitudes. The capture of tilapia is not large due the perception of it being an invasive species. A small amount of freshwater shrimp is taken and consumed.

For the purpose of the present study, annual freshwater fisheries production in FSM in recent years is estimated to be 1 mt, worth US\$8,000.

## Aquaculture Harvests

Amos et al. (2014) indicate that FSM aquaculture activities consist of corals, giant clams, sponges, blacklip pearl oyster and sandfish. To this could be added a small amount of seaweed culture. Currently, all significant FSM aquaculture activities are carried out in Kosrae and Pohnpei States.

Coral culture is being carried out in both Pohnpei and Kosrae. According to the two producers, a crude estimate of the annual production in 2014 is about 22,000 pieces (J. Mendiola, M. Selch, per. com. September 2015). The farm gate value for that production is about US\$66,000. FSM export records from CITES for the latest year available (2013) show that 3,314 pieces of live coral were exported.

Giant clam culture is being carried out in both Pohnpei and Kosrae. According to the two producers, a crude estimate of the annual production in 2014 is about 12,000 pieces. (J. Mendiola, M. Selch, per. com. September 2015). The farm gate value for that production is about US\$60,000. FSM export records from CITES for the latest year available (2013) show that 11,321 pieces of live giant clams were exported.

Following from the above information on coral and giant clam culture, in terms of regional production there may be some double-counting involved. The traders in FSM buy some cultured corals from Palau and some giant clams from Kiribati (and subsequently export them), and export some giant clams to Marshall Islands (from where they are subsequently exported).

The pearl oyster (*Pinctada margaritifera*) has been cultured since 1994 on the remote atoll of Nukuoro. The farm is community-based (owned and operated by the municipal council) and has received funding and technical support since its inception. The farm relies on the collection of wild spat to supply the farm (Lindsay 2002). According to a Pohnpei State fisheries officer with involvement in the Nukuoro farm, about 1,600 pearls were actually sold in 2014 (I. Fred, per. com. September 2015). In addition, pearl shells are sold – possibly 8 mt per year. The farm gate value of that pearl and shell production is about US\$34,000.

Sponges are cultured in Pohnpei. Annual production is about 1,800 sponges per year. (J. Mendiola, per. com. September 2015). The farm gate price of that production is estimated to be US\$4,800.

Sandfish and seaweed culture is currently at a very small scale in FSM, and the amounts harvested in 2014 were not significant.

Table 7-5 summarises the 2014 aquaculture production of FSM.

Table 7-5: The 2014 Aquaculture Production of FSM

|                         | Volume (pcs, and mt where indicated) | Farm gate value (US\$) |
|-------------------------|--------------------------------------|------------------------|
| Corals                  | 22,000                               | 66,000                 |
| Giant clams             | 12,000                               | 60,000                 |
| Pearls and pearl shells | 1,600 and 8 mt                       | 34,000                 |
| Sponges                 | 1,800                                | 4,800                  |
| <b>Total</b>            | <b>37,400 pcs and 8 mt</b>           | <b>164,800</b>         |

### Summary of Harvests

A crude approximation of the annual volumes and values<sup>2</sup> of the fishery and aquaculture harvests in 2014 can be made, based on the above sections, (Table 7-6).

Table 7-6: Annual Fisheries and Aquaculture Harvest in the FSM, 2014

| Harvest Sector         | Volume (mt, and pcs where indicated) | Value (US\$)       |
|------------------------|--------------------------------------|--------------------|
| Coastal Commercial     | 1,725                                | 5,000,000          |
| Coastal Subsistence    | 3,555                                | 8,800,000          |
| Offshore Locally based | 40,838                               | 85,342,200         |
| Offshore Foreign-based | 124,481                              | 228,148,080        |
| Freshwater             | 1                                    | 8,000              |
| Aquaculture (pcs)      | 37,400 pcs and 8 mt                  | 164,800            |
| <b>Total</b>           | <b>37,400 pcs and 170,608 mt</b>     | <b>327,463,080</b> |

Figures 7-1 and 7-2 show the volumes and values of the 2014 FSM fisheries production. Aquaculture volume is not shown, due to the use of mixed units (pieces and mt).

<sup>2</sup> The values in the table are dockside/farm gate prices, except in the case of offshore foreign-based fishing, where the value in local waters (overseas market prices less imputed transshipment costs) is given.

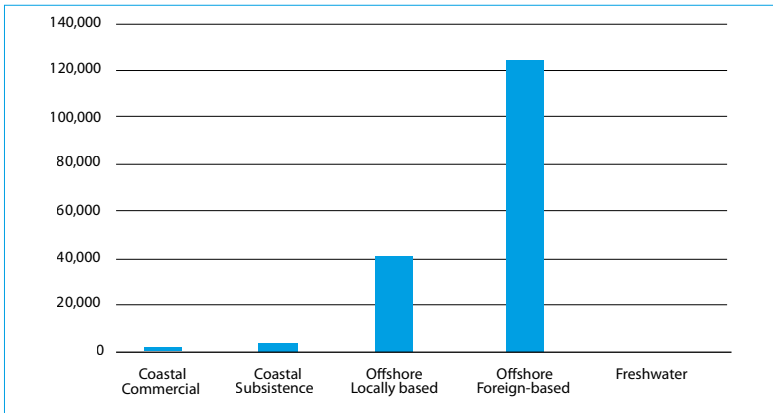


Figure 7-1: FSM Fisheries Production 2014 by Volume (mt)

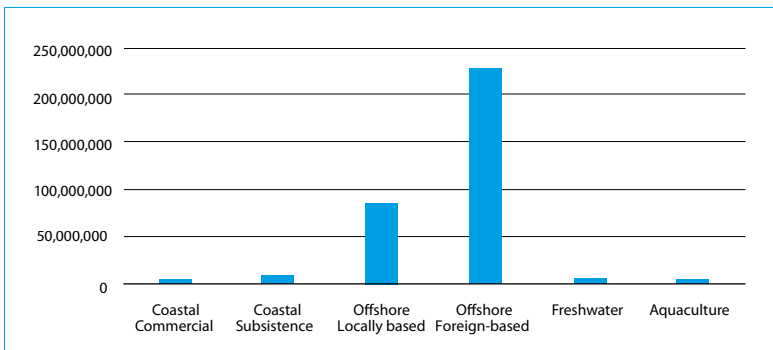


Figure 7-2: FSM Fisheries Production 2014 by Value (US\$)

### Past Estimates of Fishery Production Levels by the Benefish Studies

Similar studies of the benefits to Pacific Island countries and territories from fisheries (“Benefish” studies) have been carried out in the past. Gillett and Lightfoot (2001) focused on the year 1999, Gillett (2009) focused on 2007, and the present study focuses on 2014. The estimated fishery production levels for the FSM from those three studies are presented in Table 7-7<sup>3</sup>.

<sup>3</sup> The earliest Benefish Study, Gillett and Lightfoot (2001), did not include aquaculture, freshwater fisheries or the non-independent territories.

**Table 7-7:** Estimates by the Benefish Studies of Annual Fisheries/Aquaculture Harvests

| Harvest Sector         | Estimate Year | Volume<br>(mt, and pcs where indicated) | Value<br>(US\$) |
|------------------------|---------------|---|-----------------|
| Coastal Commercial     | 1999          | 5,000                                   | 14,500,000      |
|                        | 2007          | 2,800                                   | 7,560,000       |
|                        | 2014          | 1,725                                   | 5,000,000       |
| Coastal Subsistence    | 1999          | 5,000                                   | 10,000,000      |
|                        | 2007          | 9,800                                   | 15,732,000      |
|                        | 2014          | 3,555                                   | 8,800,000       |
| Offshore Locally based | 1999          | 2,499                                   | 12,495,000      |
|                        | 2007          | 16,222                                  | 23,908,377      |
|                        | 2014          | 40,838                                  | 85,342,200      |
| Offshore Foreign-based | 1999          | 127,000                                 | 144,000,000     |
|                        | 2007          | 143,315                                 | 177,195,590     |
|                        | 2014          | 124,481                                 | 228,148,080     |
| Freshwater             | 1999          | n/a                                     | n/a             |
|                        | 2007          | 1                                       | 8,000           |
|                        | 2014          | 1                                       | 8,000           |
| Aquaculture            | 1999          | n/a                                     | n/a             |
|                        | 2007          | 16,000 pcs                              | 80,000          |
|                        | 2014          | 37,400 pcs and 8 mt                     | 164,800         |

Source: The present study, Gillett (2009), Gillett and Lightfoot (2001)

The apparent changes in production for the three years sometimes represents a real change in production, but it can also reflect a change in the methodology for how the production is measured (hopefully, an improvement). In the table above, the production levels for coastal commercial, coastal subsistence, and freshwater change significantly between the years, but most of that change is due to the way in which the production was estimated. For example, the drop in production of coastal commercial fisheries between 2007 and 2014 is due to better information becoming available (i.e. the University of Guam studies), rather than a decrease in the amount of fish being harvested. In contrast, changes in production figures in the table for the offshore fisheries and aquaculture (based on the availability of better quality data) are likely to reflect real changes in the amounts being harvested.

## 7.2 Contribution of Fishing to GDP

### Current Official Contribution

The FSM GDP estimates are contained in the FY 2014 Statistical Compendium (Graduate School 2015). The compendium was prepared by the Graduate School USA, Pacific Islands Training Initiative, Honolulu, Hawaii, in collaboration with the Office of Statistics, Budget and Economic Management, Overseas Development Assistance and Compact Management. It was prepared under a contract with the United States Department of the Interior, Office of Insular Affairs. Fisheries aspects of the GDP were obtained from the compendium and are presented in Table 7-8.

Table 7-8: Fisheries Contribution to GDP (US\$ millions)

|                               | FY 2009 | FY 2010 | FY 2011 | FY 2012 | FY 2013 | FY 2014 |
|-------------------------------|---------|---------|---------|---------|---------|---------|
| Fisheries contribution to GDP | 28.4    | 30.7    | 37.2    | 46.5    | 37.3    | 31.8    |
| GDP at purchasers prices      | 278.5   | 295.6   | 310.4   | 325.8   | 315.7   | 318.1   |
| Fisheries as a % of GDP       | 10.2%   | 10.4%   | 12.0%   | 14.3%   | 11.8%   | 10.0%   |

Source: Graduate School (2015)

### Method Used to Calculate GDP

The individuals in the Graduate School responsible for the national accounts have a considerable amount of national accounts expertise, as well as years of experience in Micronesia. For various reasons, described in Section 30-4, those individuals have decided to treat the fishing sector in FSM somewhat differently than, for example, the International Monetary Fund and what is described in Appendix 3 of this book (hence “fisheries” instead of “fishing” in Table 7-8, above). The major changes the Graduate School has made are excluding the value added from foreign-owned, locally based fishing vessels, but including all fish processing and the shore-based services of the companies operating the foreign-owned, locally based fishing vessels. According to the individual compiling the GDP calculations at the Statistics Division (G. McKinlay, per. com. September 2015), the fisheries component includes the following:

- Shore-based services for fishing vessels
- Caroline and Diving Seagull fishing companies

- The onshore operations of the National Fisheries Corporation, Taiyo Micronesia Corporation and Kasar Fishing Corporation (but not their fishing operations)
- Coastal commercial and subsistence fishing
- Aquaculture (in principle, but not in practice, due to the difficulty of obtaining data).

### Alternative Estimate of Fishing Contribution to GDP

Table 7-9, below, represents an alternative to the official method of estimating fishing contribution to GDP in FSM. It is a simplistic production approach that takes the values of five types of fishing/aquaculture activities for which production values were determined in Section 7.1, above (summarised in table 7-6), and determines the value added by using value added ratios (VARs) that are characteristic of the type of fishing concerned. Those VARs were determined through knowledge of the fisheries sector, and by using specialised studies (Appendix 3).

Table 7-9: Fishing Contribution to GDP in 2014 Using an Alternative Approach

| Harvest Sector         | Gross Value of Production (US\$) | VAR       | Value Added (US\$) |
|------------------------|----------------------------------|-----------|--------------------|
| Coastal Commercial     | 5,000,000                        | 0.75      | 3,750,000          |
| Coastal Subsistence    | 8,800,000                        | 0.85      | 7,480,000          |
| Offshore Locally based |                                  |           | 0                  |
| Longline               | 22,518,450                       | 0.2       | 4,503,690          |
| Purse seine            | 62,823,750                       | 0.5       | 31,411,875         |
| Freshwater             | 8,000                            | 0.95      | 7,600.00           |
| Aquaculture            | 164,800                          | 0.55      | 90,640.00          |
| <b>Total (US\$)</b>    | <b>85,515,000</b>                | <b>--</b> | <b>47,243,805</b>  |

Source: Above sections, and VARs from Appendix 3

The total contribution from fishing in calendar year 2014 in the table above (US\$47.2 million) is 14.9% of GDP of US\$318.1 million in FY 2014.

The major difference between the above estimate and the official estimate of the 10% fisheries contribution given in the section above is obviously that the official estimate includes shore-based services and excludes the operations of some locally based industrial fishing vessels. There are advantages to both the methodology of the official estimate and that of the present study.

The former is oriented towards obtaining a picture of the entire national economy, and the cyclical ups and downs of industrial tuna fishing may distort other important changes in the economy. The present study is fisheries-oriented and, as such, it is important for tracking the economic contribution of locally based fleets – something that most countries in the region (including FSM) have been promoting for many years. Also, it is important for comparison purposes that the present study uses a methodology consistent with Gillett (2009).

### 7.3 Exports of Fishery Production

Discussion with the staff of the FSM Statistics Division (M. Chigiyal, per. com. Sept 2015) yielded information that is important in understanding FSM export statistics. There is no existing requirement in FSM for exporters to complete an exports declaration form with the Customs Department. Therefore, the Statistics Division uses an estimated number from other data sources. Data sources for offshore fish exports are the National Oceanic Resource Management Authority, the National Fisheries Corporation and staff estimates.<sup>4</sup> Data sources for inshore fish exports are quarantine records and airlines freight records for Chuuk State. The Statistics Division policy for inclusion/exclusion in fish exports is that fish should be included in exports if the exporting company is considered part of the FSM economy. Accordingly, the Statistics Division has deemed that the catch of the locally based longliners is not considered an export of FSM. The 2013 and 2014 FSM exports of fishery products are given in Table 7-10.

Table 7-10: Volume and Value of Fishery Product Exports

|                       | Volume 2013<br>(kg) | Value 2013<br>(US\$) | Volume<br>2014 (kg) | Value 2014<br>(US\$) |
|-----------------------|---------------------|----------------------|---------------------|----------------------|
| Purse seine tuna      | 14,105,931          | 21,501,445           | 18,797,325          | 18,211,276           |
| Longline tuna         | 0                   | 0                    | 0                   | 0                    |
| Reef fish             | 154,038             | 1,302,160            | 124,103             | 1,040,484            |
| Crab/lobsters         | 6,230               | 35,657               | 12,029              | 248,176              |
| Trochus shell         | 0                   | 0                    | 0                   | 0                    |
| Live clams            | 4,003               | 173,744              | 196                 | 853                  |
| Other marine products | 8,033               | 124,253              | 3,734               | 99,401               |
| <b>Total</b>          | <b>14,278,235</b>   | <b>23,137,259</b>    | <b>18,937,387</b>   | <b>19,600,190</b>    |

Source: Statistics Division (unpublished data)

<sup>4</sup> One of the most experienced offshore fisheries specialists in Micronesia joined the Statistics Division in 2007.



It is likely that some of the export categories in the table are under-estimated. Careful monitoring of reef fish exports by a University of Guam researcher during 2014 indicated that almost 200 mt of reef fish were exported from Chuuk to Guam alone. In the aquaculture section above it is estimated that about 12,000 giant clams were exported in 2014.

In the table above the nominal value of all exports of fishery products in 2014 (US\$19.6 million) can be compared to the total exports of the country. Graduate School (2015) gives the total exports of FSM in 2014 as US\$39.9 million, but of this US\$13.0 million was for “Re-exports: fuel”, so the real exports of the country could be considered to be US\$26.6 million. Fishery products therefore represented 73.7% of the country’s exports in 2014.

## 7.4 Government Revenue from Fisheries

### Access Fees for Foreign Fishing

According to Phillip et al. (2015), the licensed foreign fishing in the FSM zone consisted of 83 longliners, 20 pole-and-line vessels, and 143 purse seiners. Those vessels were flagged in 12 different countries. Table 7-11 shows the access fees by category of vessel by calendar year.

Table 7-11: FSM Access Fees (US\$)

| Year | Longline  | Pole and Line | Purse Seine | Support vessel | Total      |
|------|-----------|---------------|-------------|----------------|------------|
| 2012 | 1,517,200 | 715,842       | 27,123,287  | 80,700         | 29,437,029 |
| 2013 | 793,625   | 612,110       | 29,731,302  | 71,400         | 31,208,437 |

Source: NORMA (unpublished data)

More up-to-date data is available from the FSM Statistics Division, but it is presented in a different form. Table 7-12 shows the fees actually collected (from government audits) by fiscal year (1 October - 30 September).

Table 7-12: Access Fees Collected (US\$ millions)

| Fiscal Year | Fees collected (cash) | Fees (in kind) | Total  |
|-------------|-----------------------|----------------|--------|
| FY 2008     | 17.045                | 0.257          | 17.303 |
| FY 2009     | 20.016                | 0.288          | 20.304 |
| FY 2010     | 17.727                | 0.308          | 18.035 |
| FY 2011     | 18.811                | 0.317          | 19.128 |
| FY 2012     | 26.384                | 0.354          | 26.738 |
| FY 2013     | 35.050                | 0.275          | 35.325 |
| FY 2014     | 47.518                | 0.219          | 47.737 |

Source: Graduate School (2011)

The fee information in the table can be compared to total government revenue.<sup>5</sup> Table 7-13 shows that access fees as a proportion of government revenue have steadily increased in recent years.

**Table 7-13:** Access Fees as a Percentage of Government Revenue

|  | FY 2010 | FY2011  | FY 2012 | FY 2013 | FY2014  |
|--|---------|---------|---------|---------|---------|
| Access fees cash US\$ millions (from above table)              | 17.727  | 18.811  | 26.384  | 35.050  | 47.518  |
| Government revenue US\$ millions (from Graduate School [2015]) | 201.488 | 202.833 | 217.766 | 200.905 | 227.111 |
| Access fees as a % of government revenue                       | 8.8%    | 9.3%    | 12.1%   | 17.4%   | 20.9%   |

## Other Government Revenue from Fisheries

The NORMA annual reports do not provide information on government revenue, other than fishing access fees. In FSM much of the non-access government revenue from the fisheries sector is acquired at the state level.

For example, OFA (2015) gives the revenue that the Pohnpei State government received from the fisheries sector in FY 2014. This includes the following:

- Water bunkering: US\$179,126 (mostly for fishing vessels)
- Transshipment: US\$117,721 (for the period March – September 2013)
- Commission on ice sales: US\$197

## 7.5 Fisheries-Related Employment

The FSM Statistics Division collects employment information from the Social Security Administration and government payrolls. Table 7-14 from Graduate School (2015) shows the nominal and relative employment in the fishing industry. This could be considered equivalent to the number of formally employed wage earners in the fishing industry, and would not include self-employment or work for a small fishing business unless taxes and social security are paid.

**Table 7-14:** Employment in the Fishing Industry

|   | FY2009 | FY 2010 | FY 2011 | FY 2012 | FY 2013 | FY 2014 |
|---|--------|---------|---------|---------|---------|---------|
| Number of people employed in fishing industry | 261    | 327     | 294     | 247     | 269     | 250     |
| Total employment in FSM                       | 15,969 | 16,063  | 15,733  | 14,956  | 14,950  | 15,537  |
| Fishing as a % of total employment            | 1.7%   | 2.1%    | 1.9%    | 1.6%    | 1.8%    | 1.7%    |

Source: Graduate School (2015)

<sup>5</sup> Includes tax revenue, grants and other revenue.

The 2013/2014 household income and expenditure survey (Statistics Division 2014) contains some Fisheries-related employment information, as follows:

- 1.8% of total wage and salary income comes from fishing
- 12.9% of households are involved with subsistence fishing
- The net monthly value from subsistence fishing is US\$18 per household

The Forum Fisheries Agency has a programme – Economic Indicators Project – that collects information on tuna-related employment in standard form. Table 7-15 shows FSM’s tuna-related employment in recent years.

Table 7-15: FSM Tuna-Related Employment

|   | 2010       | 2011       | 2012       | 2013      | 2014       |
|---|------------|------------|------------|-----------|------------|
| Employment in tuna processing and ancillary | 183        | 151        | 97         | 65        | 66         |
| Local crew on tuna vessels                  | 47         | 44         | 49         | --        | 49         |
| <b>Total</b>                                | <b>230</b> | <b>195</b> | <b>146</b> | <b>--</b> | <b>115</b> |

Source: FFA (2014)

Quantifying gender participation in fisheries appears to have received limited attention in FSM. In 2000 and 2001, at the request of the FSM government, baseline surveys were conducted in Yap, Pohnpei, Chuuk and Kosrae, assessing the role of women in the fisheries sector, opportunities and constraints to their development, and areas for assistance (Lambeth and Abraham 2001). Although some valuable ideas were put forward in that study, little quantitative information was produced on the participation of women in fisheries.

In SPC’s ProcFish Programme four locations were studied in FSM: two in Yap State and two in Chuuk State. SPC (2013) states that in Yap 20% of fishers were women and in Chuuk 32% were women.

## 7.6 Levels of Fishery Resource Consumption

Gillett (2009) examined past estimates of fish consumption in FSM. The various studies gave annual per capita consumption in the range of 72 kg to 114 kg per person per year. The Gillett (2009) study estimated that the consumption of domestic and imported fishery products (including leakage from tuna transshipment operations) in the mid-2000s was 142 kg per person per year.

Bell et al. (2009) uses information from household income and expenditure surveys (HIES) conducted between 2001 and 2006 to estimate patterns of

fish consumption in Pacific Island countries and territories. The HIES were designed to enumerate fish consumption based on both subsistence and cash acquisitions. For the whole of FSM the annual per capita fish consumption (whole weight equivalent) was 69.3 kg, of which 92% was fresh fish. For rural areas the figure for the per capita consumption of fish was 76.8 kg, and for urban areas it was 67.3 kg.

Vali et al. (2014) attempted to reconstruct historical fish catches in FSM. They assumed a per capita subsistence catch rate of 90.71 kg/person/year, and a per capita artisanal catch rate of 25.92 kg/person/year.

The present study estimated, for 2014, a coastal subsistence fishery production of 3,337 mt and a non-exported coastal commercial fisheries production of 1,693 mt. The total non-exported coastal production was therefore 5,030 mt. With an FSM population of 102,908, that equates to an annual per capita consumption of domestic coastal fishery products of 49.9 kg. Kroonen et al. (2009) indicate that the average annual per capita consumption of fresh fish at the four sites in SPC's ProcFish Programme (two in Yap State and two in Chuuk State) was about 63 kg.

Rhodes et al. (2015) provide information on fish consumption on Pohnpei, expressed as edible amounts (i.e. food actually consumed, as opposed to whole weight equivalent in the above studies). They estimated that the annual per capita consumption of reef fish, pelagic fish and non-fresh fish on Pohnpei ranged from 94 to 126 kg. This consumption rate does not consider imported fishery products, local sales of tuna from locally based offshore fishing, or leakage from tuna transshipment operations.

Englberger et al. (2002) is a detailed review of the nutritional literature of FSM. Although there is some mention of fish, there is no mention of per capita fish consumption. There have apparently been no recent nutrition surveys in FSM providing information on fish consumption (A. Lawrence, per. com. August 2015).

## 7.7 Exchange Rates

Federated States of Micronesia uses the US dollar (US\$).