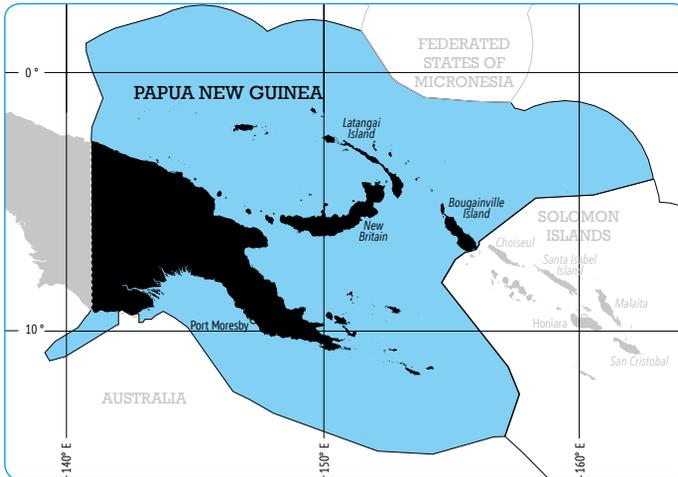


## 14 Papua New Guinea



### 14.1 Volumes and Values of Fish Harvests in Papua New Guinea

#### Coastal Commercial Catches in Papua New Guinea

The following describe some of the main historical attempts to estimate production from coastal commercial fisheries in Papua New Guinea (PNG):

- Dalzell et al. (1996), using information from the late 1980s and early 1990s, estimated that PNG's coastal commercial fisheries annually take 4,966 mt, worth US\$22.1 million.
- Preston (1996) states that the annual commercial fisheries production in the mid-1990s was about 4,800 mt, worth K16.4 million (PNG Kina (K)).

- Gillett and Lightfoot (2001) considered several sources of information for coastal commercial production for the years 1989 to 1991, and ventured an estimate of 5,500 mt, worth K55 million.
- Gillett (2009) examined the above studies and some more recent information. He ventured an estimate that coastal commercial fisheries production in the country in the mid-2000s was 5,700 mt, worth K80 million to the producer.

There has been no recent research aimed at assessing the total production of PNG's coastal commercial fisheries. Consequently, the method used here is to modify previous estimates, based on known changes that may affect fisheries production and various sources of recent information on the economically important coastal commercial fisheries.

Knowledge of the production of coastal commercial fisheries in PNG is quite poor, except for commodities that are exported. Teh et al. (2014) describe the situation (Box 14-1).

#### Box 14-1: Coastal Fisheries Data

Fisheries data collection falls under the responsibility of the National Fisheries Authority, though there are plans to have Provincial Fisheries Officers collect catch and landings data. The need for establishing a comprehensive statistics collection system in PNG for effective fisheries management has been recognised for almost 40 years. Data for the tuna industry after 2001 is fairly reliable due to the implementation of effective catch logsheet and observer programmes. Unfortunately, the same level of reporting for artisanal fisheries is not regularly collected, except for aid donor projects, such as the Asian Development Bank project which conducted landing and market surveys in the New Ireland, Morobe and Milne Bay Provinces in the mid-2000s. Relatively reliable catch and export data exist for some inshore commercial fisheries such as sea cucumbers and trochus. Here, statistics on fisheries such as reef finfish, sea cucumber, lobster, and trochus only cover the quantity that is exported and not what is consumed locally. There are also large time series gaps in data, as trochus is not reported regularly while sea cucumber landings only started to appear in 1981 despite having been exported since the late 1800s. Finally, there is no accounting for small-scale subsistence fisheries, despite this sector's substantial importance to local wellbeing.

Source: Teh et al. (2014)

Although similar situations exist in many Pacific Island countries, the PNG case is perhaps the most difficult to improve, due to the size of the country, the number of coastal villages and the isolation of many production sites. Another factor is the reduction in the amount of information that is readily

available from the National Fisheries Authority (NFA). In the past a substantial amount of information on the production from various coastal commercial fisheries was contained in NFA annual reports and newsletters. The last NFA annual report was for 2012 (L. Gisawa, per. com. August 2015), but even that issue is currently not readily available. The NFA newsletters ceased in 2013 (G. Puri, per. com. August 2015).

Some specific features and recent changes that should be taken into consideration in estimating production from PNG's coastal fisheries are described below:

- The population of PNG has increased from 6,324,106 in 2007 to 7,570,686 in 2014 (a 16.5% increase).
- The situation is fairly good with respect to the sustainability of the exploitation of the fisheries. Overall, exploitation of coastal fisheries in PNG is thought to occur below localised maximum sustainable yields, although fishing pressure has seen the collapse of some fisheries in some localities, especially in areas close to urban centres, and has resulted in a nation-wide moratorium on beche-de-mer trade. (NFA 2015)
- The rehabilitation of several ice-producing plants and coastal fisheries centres has facilitated a moderate increase in coastal fisheries production. (A. Taunega, per. com. August 2015)
- The beche-de-mer trade was closed in 2009 for an initial three-year period, and this closure was then extended for another three-year period. (J. Kinch, per. com January 2016)
- There was a moderate spike in the cost of fuel in 2008.
- Other than the beche-de-mer ban and the fuel spike, NFA staff could not identify other major disruptions or shocks to coastal fisheries production.

Information obtained from discussions with NFA staff and other fishery stakeholders, and from the limited amount of documentation, is used to describe some recent features and changes in the major coastal commercial fisheries in the country. The sources are personal communications (L. Gisawa, J. Kinch and M. Brownjohn), Carleton (2013), SPC (2012), NFA (2008), NFA (2015), Barclay and Kinch (2013), and Sullivan and Ram-Bidesi. (2008):

- **Beche-de-mer:** The 15-year (1998–2012) average production was 467 mt (dry weight), at US\$23/kg (2012 prices). The historical high was in 2006, when 679 mt (worth K37 million) was produced. The fishery was closed in 2009.

- **Lobster:** The fishery has experienced little net change in volume, but there had been a gradual increase in price, which has stalled recently. The new live trade into Australia (only one PNG operator) has changed the fishery in accommodating live supply, and increased lobster prices.
- **Prawn:** Annual production has historically typically varied between 400 mt and 1,300 mt, but both the number of active boats and production have declined in recent years. The current management plan allows only 14 boats to participate in the fishery.
- **Trochus:** From a maximum-recorded harvest in 1989 of 568 tonnes, the production declined to about 345 mt in the mid-2000s. When the beche-de-mer fishery closed in 2006 trochus production increased.
- **Artisanal shark fishing:** This activity increased considerably with the ban on pelagic shark fishing in mid-2014, and then again with the closure of the beche-de-mer fishery. The pelagic shark fishery was closed in response to a Western and Central Pacific Fisheries Commission (WCPFC) management measure prohibiting the taking of silky sharks, which made up about 83% of the commercial catch. (M. Brownjohn, per. com. January 2016)
- **Barramundi:** This fishery now produces about 80–100 mt per year, which is still well below the more than 300 mt of past years.
- **Gamefishing:** This fishery has gradually increased in the last two decades, in both marine and freshwater.
- **Artisanal deep water snapper:** This fishery has declined, which is at least partially due to the inefficient, petrol-driven boats used in the fishery, fuel cost increases, and markets.
- **Various coastal fishery development schemes:** The initiatives of various agencies (e.g. IFAD, EU, GTZ) and of the PNG government to increase production from under-exploited fishery resources have usually collapsed when subsidies have stopped.

Further to the final point, above, small-scale commercial fishing for non-perishable, high-value export commodities has historically been quite important. In contrast, commercial catches of finfish for domestic markets appear surprisingly small, relative to the country's population and resource endowment. Two decades ago Preston (1996) stated that the commercial development of small-scale coastal fisheries has been viewed as a means of generating rural earnings and other social and economic benefits, and has

been a government target in PNG for nearly 45 years, but that success has been elusive. Barclay and Kinch (2013) explore this issue:

Why have cash-earning food fisheries not taken off in most rural coastal and island areas in PNG and the Solomon Islands to date? The main reason would appear to be that such fisheries are usually not profitable without high external inputs. Unlike high-value, easy-to-store-and-transport shells and dried marine products, fresh, chilled and frozen fish are low value to weight and are tricky to store and transport in good condition. The costs and difficulties involved in getting fish from rural areas out to markets, and getting fuel and mechanical repairs into rural coastal areas, usually outweigh the prices fetched by the fish. When project funding stops, therefore, the fisheries stop soon after.

The information presented in this section is entirely inadequate for estimating coastal commercial fisheries production in PNG. The amount and quality of information to enable reasonably-well-informed “guesswork” appear to have deteriorated in the last two decades.<sup>1</sup> The approach taken in the present study is to take the Gillett (2009) estimates, and adjust them for the relevant information in this section. Overall, this appears to result in a moderate increase in the volume and value of coastal commercial fisheries production between 2007 (the focal year for the 2009 study) and 2014 (the focal year for the present study).

The production from PNG coastal fisheries is deemed to be 6,500 mt, with a value to the producer of K130 million.

### Coastal Subsistence Catches

The following are the four estimates of coastal subsistence catches in PNG that are often cited:

- Dalzell et al. (1996), using information from the late 1980s and early 1990s, estimated that PNG’s subsistence fisheries annually take 20,588 mt, worth US\$41,176,000.

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<sup>1</sup> Staff of the National Statistics Office (NSO) indicated that, with a modest amount of funding, the latest household income and expenditure survey (HIES) could be re-analysed for fishery production information. (H. Kari and D. Skutenko, per. com. August 2015). This could lead to a remarkable improvement in the estimates of coastal commercial fisheries production (both commercial and subsistence). Alternatively, with some fisheries input, the NSO could design the next HIES (likely to be in 2018) to be more “fisheries friendly”.

- Preston (1996), using several sources, concluded that PNG's subsistence fisheries annually take 26,000 mt.
- Gillett and Lightfoot (2001) considered the above two estimates, and other information. to venture annual estimates of 26,000 mt in catch, worth K52 million.
- Gillett (2009) considered the 2001 study, above, and the results of a 1996 household income and expenditure survey. He estimated the coastal subsistence production of PNG in the mid-2000s to be 30,000 mt, worth K105 million.

To some degree, the above estimates have been institutionalised. For example, NFA (2015) states: "annual coastal subsistence fisheries catches in PNG range from 20,600 to 30,000 tons."

As with the coastal commercial fisheries situation in PNG, the available information is highly inadequate for making an estimate of production from the country's subsistence fisheries. The only practical option for estimating current coastal subsistence production is to adjust previous estimates. Accordingly:

- the volume of the 2014 subsistence production is estimated to be 30,000 mt, plus an adjustment for the change in population in the 2007–2014 period (a 16.5% expansion), or about 35,000 mt; and
- assuming that the average fish price in non-urban markets was K7 per kg in 2014 (L. Gisawa, G. Puri, per. com. August 2015), and using the farm gate system of valuing subsistence production in the Pacific Islands (Bain 1996)<sup>2</sup>, this coastal subsistence production of 35,000 mt can be valued at K171.5 million to producers.

### Locally Based Offshore Catches

The paper presented by the PNG delegation to the meeting of the Scientific Committee of the Western and Central Pacific Fisheries Commission (Usu et al. 2015) gives information on the PNG-based offshore fishery:

The Papua New Guinea (PNG) tuna fishery is made up of both the purse-seine and longline sectors with a small handline sector. The longline and handline sector is a citizen - only activity and all vessels fish exclusively in the waters under PNG national

<sup>2</sup> Discounting the average fish price in the market by 30% as allowance for getting the product to market.

jurisdiction<sup>3</sup>. The purse-seine sector is a mix of both domestic and foreign access vessels. The domestic sector comprises the PNG flag vessels and PNG chartered vessels (locally based foreign) which support processing facilities onshore in PNG. While the PNG flagged vessels fish primarily in PNG waters, the chartered vessels fish both in PNG waters and waters outside of PNG.

For the purposes of the present study, the PNG-based purse seine vessels are taken to be PNG-flagged vessels and locally based foreign vessels. The affiliations of these vessels are complex. A study carried out in early 2015 (McCoy et al. 2015) gives information on this fleet (Table 14-1). The number increased further in late 2015 due to access policy changes.

**Table 14-1:** Summary of Number of Vessels Associated with PNG-Registered Companies and Locally Based Foreign Companies

Company Granted Licenses	Parent Company and Nationality Linkage	Parent Company Relationship to Vessels	Number of Purse Seiners
Frabelle (PNG) Ltd	Frabelle, Philippines	owner	11
Frabelle Fishing Corporation	Frabelle, Philippines	owner	4
Pacific Blue Sea Fishing	Philippines	owner	1
Dologen Ltd.	PNG	(operates in conjunction with Frabelle)	1
Rell & Renn Fishing (PNG) Ltd	Philippines	owner	1
RD Fishing PNG Ltd	RD, Philippines	owner	17
South Seas Tuna Corporation Ltd (SSTC)	FCF, Taiwan	Agent for Taiwanese and other owners	14
Fair Well Fishery (PNG) Ltd	Fair Well Fishery Co. Ltd, Taiwan	owner	5
Majestic Seafoods Corporation	Thai Union, Thailand; Century Canning Corp., and Frabelle, Philippines	Believed to be Frabelle	8

Source: McCoy et al. (2015)

The production of the PNG-based seiners is given in Usu et al. (2015). The value of this catch is determined by information in FFA (2015). The values (at overseas destinations) are adjusted to equate to PNG in-zone prices. This volume and value information is given in Table 14-2.

<sup>3</sup> It is reported that there are six Taiwanese longline vessels with Taiwanese crew fishing out of Kavieng, under a local licence held by Nuigini Island Seafood Products. (J. Kinch, per. com. January 2016)

**Table 14-2:** Catches of the PNG-Based Purse Seiners (catches include non-tuna species)

	2010	2011	2012	2013	2014
<b>Volume:</b> PNG-flagged purse seiners (mt)	27,972.30	26,869.82	46,085.78	38,419.44	54,770.86
<b>Volume:</b> PNG-based foreign purse seiners (mt)	177,865.17	171,888.86	193,124.12	188,642.09	160,433.05
<b>Volume:</b> total catch by PNG-based purse seiners (mt)	205,837.47	198,758.68	239,209.9	227,061.53	215,203.91
<b>Value:</b> total catch by PNG-based purse seiners (US\$)	247,653,694	331,005,644	479,160,215	429,208,292	307,240,640

Source: Usu et al. (2015)

Usu et al. (2015) give information on PNG-based longliners:

The low catch and effort is due to a reduced number of tuna longline vessels from 27 active vessels in 2012 to 10 active vessels in 2014. The high cost of goods and services such as fuel and shipping still proves to be a challenge in longline operations. Moreover, 7 vessels lost their license to fish in PNG waters after the first quarter of 2013 as a result of their company's failure to meet licensing conditions and more vessels have gone for repairs in the 2014 fishing period.

The catches for the PNG-based longliners are provided in Table 14-3. The volumes are based on Usu et al. (2015), and the values are based on FFA (2015), adjusted by the lower value of the bycatch and by transport costs to overseas markets (i.e. to equate to PNG in-zone prices).

**Table 14-3:** Catches of the PNG-Based Longliners (catches include non-tuna species)

	2010	2011	2012	2013	2014
Volume: PNG-flagged longliners (mt)	3,501.95	2,655.83	3,103.66	1,430.45	1,106.12
Value: catch by PNG-based longliners (US\$)	12,130,283	11,133,254	12,213,381	5,065,786	3,980,384

Source: Usu et al. (2015)

The following summarises some relevant production information on other types of locally based offshore fishing:

- A small handline fleet of about five vessels is operating in waters around Madang and Morobe provinces. Catch by these vessels, which do not normally exceed 10 mt (estimate) per year, is sold to processing companies and local supermarkets (Usu et al. 2015). The value of this catch to fishers in 2014 is assumed to be K150,000 (based on an informed estimate).
- A shark longline fishery operated for several years. The fishery was limited to 9 vessels, setting 1,200 hooks per day, with a total allowable catch of 2,000 mt dressed weight per year. All vessels in this fishery fished only in PNG waters. The shark fishery was closed in mid-2014 due to high catches of silky sharks, which is regulated by a WCPFC measure. The total 2014 catches of the shark fleet are estimated to be 576.57 mt. (Usu et al. 2015) The value of this catch to fishers in 2014 is estimated to be K3.7 million.

The following summarises the 2014 PNG-based offshore catches:

- Purse seine: 215,204 mt, with an in-zone value of US\$307,240,640 (K789,608,445)
- Longline: 1,106 mt, with an in-zone value of US\$3,980,384 (K10,229,587)
- Handline and shark fishing: 586 mt, worth to fishers K3,850,000
- Total: 216,896 mt, worth K803,688,032

### Foreign-Based Offshore Catches

According to the paper presented by the PNG delegation to the 2015 meeting of the Scientific Committee of the WCPFC (Usu et al. 2015), the tuna catch in PNG waters by foreign-based offshore fishing vessels consisted entirely of fish caught by purse seine fishing gear. The report states: “The vessels are licensed under the conditions of access agreements between PNG and their company, fishing association or home party state and also include foreign vessels fishing under the terms of the US Treaty and FSM Arrangement. In the last five years, annual catches by foreign vessels fishing in PNG waters have averaged around 365,270.13 mt.”

It is not possible to calculate the catches of foreign-based purse seiners in the PNG zone using only information contained in Usu et al. (2015). Although that publication gives the foreign purse seine catch in the PNG zone, it does not partition that catch into foreign locally based and foreign overseas based. FFA (2015) gives the total purse seine catches in the PNG zone, and by

subtracting the locally based purse seine catches in the PNG zone (from the section above) from the total purse seine catch (from FFA 2015), the foreign-based purse seine catch in PNG can be determined (Table 14-4). The values given are derived from prices in FFA (2015), adjusted for bycatch and transport, with the latter to compensate for the fact that FFA prices are at destination markets overseas, while the offshore catch values of the present study are in-zone values.

Table 14-4: Calculating the Catches of the Foreign-Based Purse Seiners

	2010	2011	2012	2013	2014
1	Volume: total purse seine catch in PNG zone (FFA 2015, with addition or bycatch), mt	587,061.00	540,051.00	561,689.00	325,832.00
2	Volume of catch of PNG-flagged purse seiners in PNG zone (Usu et al. 2015), mt	27,971.46	45,973.14	36,960.09	44,171.85
3	Volume of catch of PNG-based foreign purse seiners in PNG zone (Usu et al. 2015), mt	114,468.14	122,315.58	114,533.01	63,789.32
4	Volume of catch of all PNG-based purse seiners in PNG zone (row #2 above plus row #3), mt	142,439.60	149,185.40	160,506.15	151,480.19
5	Volume of catch by foreign-based purse seiners in the PNG zone (row #1, above, minus row #4), mt	533,095.00	437,876.00	379,545.00	410,209
6	Value of catch by foreign-based purse seiners in the PNG zone, US\$	641,394,617	729,222,467	760,264,488	775,406,661
					311,048,127

Notes: The purse seine catches in Usu et al. (2015) include non-tuna species; the purse seine catches in FFA (2015) are only tuna (hence the adjustment in row #1)

In summary, the 2014 catches by foreign-based offshore vessels were 217,871 mt, with an in-zone value of US\$311,048,127 (K799,393,686).

## Freshwater Catches

Coates (1996) describes the major features of the freshwater fisheries in PNG:

- Over 87% of the human population of PNG live inland and have no direct access to marine aquatic resources.
- Even in highland areas of Papua New Guinea, where fish stocks are very poor, over 50% of the population engage in fishing activities in many areas, traditionally for eels, but more recently catches include a number of exotic species.
- Commercial exploitation of freshwaters in Papua New Guinea is limited: southern flowing rivers support a small barramundi (*Lates calcarifer*) fishery, although this has recently declined; modest amounts of freshwater prawns are landed seasonally, estimated at no more than 10 mt per year.

The Fly River system in PNG's Western Province is the largest river in the country, and has the most diverse freshwater fish fauna in Australasia (Swales 2000). Box 14-2 describes the river and its fisheries.

#### Box 14-2: The Fly River and its Fisheries

The first systematic survey of the fish populations of the Fly River was carried out in the mid 1970s by T.R. Roberts, who discovered that the fish populations in the Fly are characterized by the large size of some species, the abundance of endemic species and the dominance by groups that are poorly represented in other parts of the world. The Fly River system was found to support the most diverse fish fauna in the Australasian region, with 128 recorded native freshwater species representing 33 families. Seventeen species are known only from the Fly basin, and thirty or more are known only from the Fly River and one or more of the large rivers in central-southern New Guinea. The total catch from both areas reached 330 tons year in the early 1970's, but the commercial fishery on the coast ceased operation in 1990 because of declining catch rates.

The primary human use in the aquatic ecosystem is the subsistence fishery, which forms part of the traditional way of life of villagers living along the river. Most fish are consumed by the villagers, with catfish being the preferred species, compared to barramundi and black bass in the commercial fishery. It has been estimated that the current use is 416 tons/year, assuming a weekly fish intake of 2 kg/person and a population size of 4,000 people. Based on new data released in March 1999, there are now estimated to be 5,000 people living along the middle Fly River, resulting in a new fish yield estimate of 520 tons/year. These estimates do not account for by-catch that is not used or the commercial barramundi and bass fishery. Assuming that by-catch equals 10 percent of the fish consumed and that the commercial barramundi and bass fishery is responsible for approximately 36 tons/year, the estimated yield based on the combined artisanal and commercial fishery is approximately 600 tons/year.

Source: Swales (2000)

The following summarises recent information about aspects of the freshwater fisheries in PNG:

- *Tilapia niloticus* has escaped into the Fly River, and may have increased the productivity of the river. (J. Wani, per. com. August 2015)
- Carp were introduced to the Telofomin area in the 1990s and escaped into the Fly River system. They were reported at Obo in about 2000. (M. Brownjohn, per. com. January 2016)
- There was a major FAO project to introduce new freshwater fish to the Sepik-Ramu river system in the early 2000s. (Coates 1987) The impacts of that initiative are not yet known (J. Wani, per. com. August 2015), but numerous anecdotal reports suggest some species have thrived. (A. Lewis, per. com. January 2016)

- Recreational fishing of black bass is becoming important in the country, and is receiving considerable international attention. (Martin 2015)
- The current average price of fish in inland fish markets is variable, but K7 per kg could be considered an average price. (G .Puri, per. com. August 2015)

As with the situation for coastal fisheries, there is scant helpful information in PNG for making an estimate of annual production from freshwater fisheries. Preston (1966) made an educated guess of 13,500 mt annually, and this amount is often cited. Gillett (2009) took the Preston amount and increased it to account for population growth. With little alternative, the present study assumes that the 2014 PNG freshwater fishery production is that of the Gillett (2009) study, increased by the amount that the country's population has grown in the period 2007–2014. That equates to about 20,000 mt of freshwater fish per year. Assuming that the average fish price in inland markets was K7 per kg in 2014, using the farm gate system of valuation, a price of K4.90 per kg can be assigned to subsistence freshwater catches.

For the purpose of this study, the freshwater production of PNG in 2014 is taken to be 20,000 mt, worth K98 million. The very poor factual basis for this estimate is recognised.

### Aquaculture Harvests

Discussion with staff of the Aquaculture and Inland Fisheries Section of the National Fisheries Authority, and with other knowledgeable individuals, enabled the compilation of information on recent aquaculture production in PNG. The results are presented in Table 14-5.

Table 14-5: Recent Annual Aquaculture Production in PNG

Commodity	Type of production	Current estimated annual production	Farm gate price	Annual production value (K)	Comment
Tilapia	Subsistence and small-scale commercial	100 mt	K9–11 per kg	K1,000,000	Estimates of up to 50,000 farms have been made, which, combined with a total PNG production of 100 mt, equates to an average of 2 kg per farm per year
Carp	Subsistence	20 to 30 mt	K7–10 per kg	K212,500	Many farmers have switched to tilapia recently
Seaweed	Small-scale commercial	300 mt	K1 per kg	K300,000	
Trout	Production for restaurants & supermarkets	5 to 10 mt	K30–35 per kg	K243,750	Started production in late 2007; currently only one farm due to feed issues
Prawn	Production for restaurants & supermarkets	10 mt	K45 per kg	K450	Recent ownership change
Pearl	Export	Not known	Not known	Not known	Farm which started production in 2007 is currently for sale.
Barramundi	Most production is currently oriented to re-stocking	100,000 to 200,000 fingerlings	K1 per fingerling	K150,000	Farm is partly owned by mining company that is accused of polluting the Fly River so production is related to the corporate social responsibilities of that company
Crocodile	Large and small operations for export	10,000 skins	K125 per skin	K1,250,000	A few large and many small farms.

Source: J. Wani, M. Brownjohn, Altiana Trout Farm staff; Mainland Holdings staff; Gillett (2009)

The above production equates to 145 mt, plus 160,000 pieces, with a farm gate value of K3,156,700.

For many years there has been a debate on the quantity of tilapia farmed in the highlands. A 2001 survey (Smith et al. 2007) alluded to a very large number of farms in that area. A student studying tilapia in PNG stated there are between 40,000 and 50,000 small-scale tilapia operations, which, based on the average number of ponds, stocking rates, mortality and expected output, would give an annual production of 924 mt (H. Vira, per. com. September 2015). However, the Executive Manager of NFA's Aquaculture and Inland Fisheries Section considered that the student's estimate of the number of ponds and the productivity of the ponds is too high, and he confirmed his estimate of annual tilapia production in PNG of 100 mt (J. Wani, per. com. August and October 2015).

## Summary of Harvests

A crude approximation of the annual volumes and values<sup>4</sup> of the fishery and aquaculture harvest in 2014 can be made from the above sections (Table 14-6).

Table 14-6: Annual Fisheries and Aquaculture Harvest in PNG, 2014

Harvest Sector	Volume (mt, and pcs where indicated)	Value (K)
Coastal Commercial	6,500	130,000,000
Coastal Subsistence	35,000	171,500,000
Offshore Locally based	216,896	803,688,032
Offshore Foreign-based	217,871	799,393,686
Freshwater	20,000	98,000,000
Aquaculture	145 mt and 160,000 pcs	3,156,700
<b>Total</b>	<b>496,412 mt and 160,000 pcs</b>	<b>2,005,738,418</b>

The extremely weak factual basis for the estimates of coastal commercial, coastal subsistence and freshwater catches is acknowledged.

Offshore fishing in PNG in 2014 was somewhat atypical. This was a strong El Niño year, and purse seine catches characteristically move eastwards during El Niño periods (i.e. towards the Kiribati zone). This would explain why the total offshore catches (locally and foreign based) in the PNG zone in 2013 were 47% greater than those in 2014 (639,826 mt, compared with 434,767 mt).

<sup>4</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.

The following statement on the NFA website appears at odds with the K2 billion total fisheries production value for 2014 given in the table above: “The total market value of PNG catch is estimated at K350 to K400 million on average although information on the true value of artisanal fisheries is difficult to obtain and cyclical factors and commodity price movements, especially tuna, cause huge value swings from year to year.”

Figures 14-1 and 14-2 show the volumes and values of the 2014 PNG fisheries production. Aquaculture is not shown on the volumes figure due to the use of mixed units (pieces and mt).

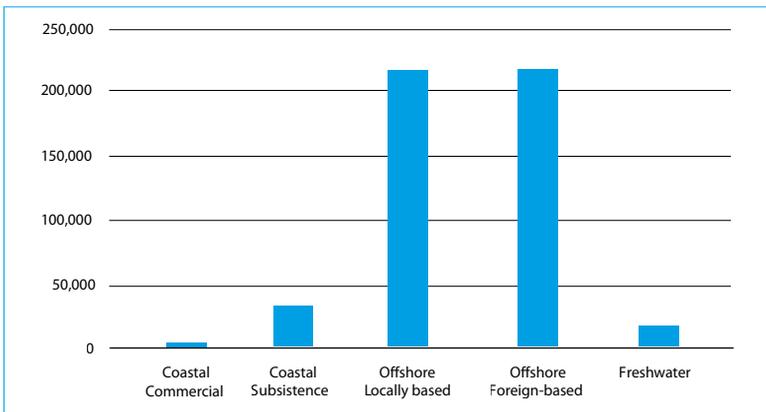


Figure 14-1: PNG Fisheries Production by Volume (mt), 2014

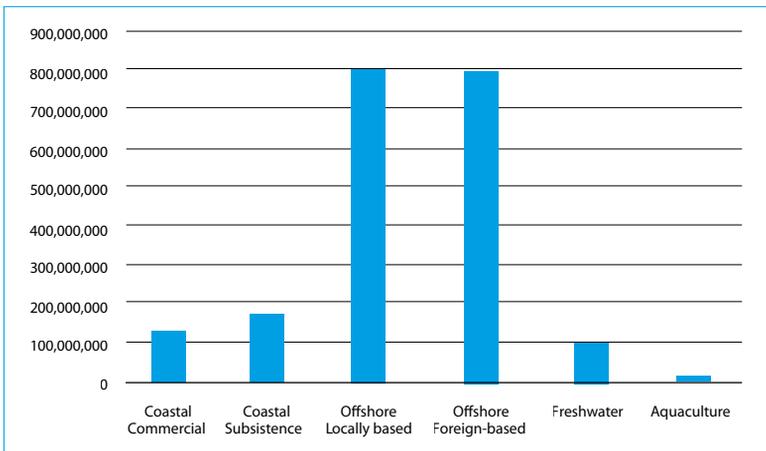


Figure 14-2: PNG Fisheries Production by Value (K), 2014

## 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 fishery production levels for PNG from those three studies are provided in Table 14-7.<sup>5</sup>

**Table 14-7:** Estimates by the Benefish Studies of Annual Fisheries/Aquaculture Harvests

Harvest Sector	Estimate Year	Volume (mt, and pcs where indicated)	Nominal Value (K)
Coastal Commercial	1999	5,500	55,000,000
	2007	5,700	80,000,000
	2014	6,500	130,000,000
Coastal Subsistence	1999	26,000	52,000,000
	2007	30,000	105,000,000
	2014	35,000	171,500,000
Offshore Locally based	1999	50,500	114,000,000
	2007	256,397	1,024,089,635
	2014	216,896	803,688,032
Offshore Foreign-based	1999	85,000	193,000,000
	2007	327,471	1,143,631,355
	2014	217,871	799,393,686
Freshwater	1999	n/a	n/a
	2007	17,500	49,000,000
	2014	20,000	98,000,000
Aquaculture	1999	n/a	n/a
	2007	200	2,000,000
	2014	145 mt and 160,000 pcs	3,156,700

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

The apparent changes in production for the three-year period represents a real change in production in some cases, but this can also represent a change in the methodology for measuring the production (hopefully an improvement). In the table above, the production levels for coastal commercial, coastal subsistence and freshwater increase slightly between the years. This is because there are no new data for those fisheries, but anecdotal information

<sup>5</sup> The earliest Benefish Study, Gillett and Lightfoot (2001), did not include aquaculture, freshwater fisheries or the non-independent territories.

suggests some increase (mostly due to population growth). 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.

## 14.2 Contribution of Fishing to GDP

### Current Official Contribution

Staff of the National Statistics Office (NSO) indicate that they have not calculated the PNG GDP for any year since 2006, due to several constraints. The NSO's activities related to GDP are currently focused on making an estimate for 2013. (H. Kari and D. Skutenko, per. com. August 2015)

The methodology for the 2006 GDP calculations was obtained from the NSO in 2008. (K. Geberi, per. com. September 2008) In the 1990s the NSO experienced difficulties in producing GDP estimates, and in the early 2000s the responsibility was transferred to the Bank of PNG. In the mid-2000s the NSO/BPNG methodology differences were reconciled, and accordingly the 2006 GDP estimates by NSO are considered the official estimates. These estimates are given in Table 14-8.

**Table 14-8:** The Official Fishing Contribution to GDP

	2002	2003	2004	2005	2006
Fishing: Market component	204.7	226.4	245.2	292.4	388.4
Fishing: Non-market component	55.5	60.8	63.2	65.8	68.4
Total Fishing	260.2	287.2	308.4	358.1	456.8
Total PNG GDP	11,872.0	13,241.5	13,459.4	15,094.7	16,896.6
Fishing as % of PNG GDP	2.2%	2.2%	2.3%	2.4%	2.7%

Notes: Current prices; units are millions of Kina  
Source: National Statistics Office (unpublished data)

### Method Used to Calculate the Official Fishing Contribution to GDP

In 2008 the staff of the NSO indicated that the general method used in most economic sectors to calculate GDP contribution is to take the gross output of production (GO), and reduce that value by intermediate consumption (IC),

to determine the value added (VA) (i.e.  $GO-IC=VA$ ). The fishing sector is partitioned into two components. To calculate the value added of “market fishing” the results of business surveys carried out in 1991, 1998 and 2004 are used, and extrapolated for future years on the basis of export data. For “non-market fishing”, the study, *Dimensions of PNG Village Agriculture* (Allen et al. 1996) provides the basic information, along with the results of the recent HIES.

Limited comment can be made on the above methodology. Fishing carried out by businesses that are too small to be covered by business surveys mentioned above could have been omitted in the coverage of “market fishing”.

Staff of the International Monetary Fund’s Pacific Financial Technical Assistance Centre, in Suva, indicated that 2006 is the last year for which PNG’s NSO has estimated the country’s GDP, however, other agencies have made estimates (R. Freeman, per. com. October 2014). NSO staff indicate that the Treasury Department has made “shadow” GDP estimates, but those would not include any treatment of fisheries. (H. Kari and D. Skutenko, per. com. August 2015) The International Monetary Fund (IMF 2015) estimates PNG’s 2014 GDP to be US\$16.8 billion (K43.2 billion).

### Alternative Estimate of Fishing Contribution to GDP

Table 14-9, below, represents an alternative to the official method of estimating fishing contribution to GDP in PNG. It is a simplistic production approach that takes the values of six types of fishing/aquaculture activities for which production values were determined in Section 14.1, above (summarised in Table 14-6), 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).

It is not intended that the approach in Table 14-9 replace the official methodology, but rather that the results obtained serve as a comparator to gain additional information about the appropriateness and accuracy of the official methodology, and to indicate any need for its modification.

**Table 14-9:** Fishing Contribution to GDP in 2014 Using an Alternative Approach

Harvest Sector	Gross Value of Production (K, from Table 14-6)	VAR	Value Added (K)
Coastal Commercial	130,000,000	0.65	84,500,000
Coastal Subsistence	171,500,000	0.90	54,350,000
Offshore Locally based			
Longline	10,229,587	0.20	2,045,917
Purse seine	793,458,445	0.50	396,729,223
Freshwater	98,000,000	0.95	93,100,000
Aquaculture	3,156,700	0.65	2,051,855
<b>Total (K)</b>	<b>1,206,344,732</b>	<b>--</b>	<b>732,776,995</b>

It is stated in this chapter, above, that there is not yet an official 2014 GDP for PNG. However, the IMF estimate of the 2014 PNG GDP is US\$16.8 billion (K43.2 billion). Using that figure, the 2014 fishing contribution from the table (K732,776,995) is about 1.7% of the 2014 GDP.

The literature contains some misinformation about the contribution of fishing to the PNG GDP, as described below:

- ADB (2014) indicates the contribution of fishing to GDP was 3.4% in 2007, quoting Gillett (2009). The 2009 study did not estimate a 2007 contribution, but rather cited the official 2006 contribution of 2.7%.
- Martin (2015) states: “PNG witnessed significant growth in the fisheries sector due to political stability and GoPNG’s focus and support on downstream processing through export led growth strategy thus increasing contribution from the fisheries sector from 3 - 5% of GDP”. This is significantly higher than the Gillett (2009) estimated contribution (1.7%).

## 14.3 Exports of Fishery Production

The marine product exports of PNG are shown in Table 14-10. It can be seen that the nominal value has increased over the period 2007–2014.

**Table 14-10:** Value and Volume of Fishery Product Exports

	Value marine products (K millions)	Value all domestic exports (K millions)	Volume marine products (mt thousands)	Value marine products as % of domestic exports
2007	221.6	14,058.8	49.3	1.6%
2008	293.2	15,655.6	55.8	1.9%
2009	232.9	12,079.8	55.4	1.9%
2010	114.0	15,601.8	34.1	0.7%
2011	259.8	16,376.1	67.5	1.6%
2012	329.5	13,181.4	71.1	2.5%
2013	234.4	13,337.3	46.2	1.8%
2014	345.9	21,767.1	69.6	1.6%

Source: Website of Bank of Papua New Guinea ([www.bankpng.gov.pg](http://www.bankpng.gov.pg))

The information in the above table derives from the Customs Department. The National Fisheries Authority maintains an independent database of the exports of fishery products. Unfortunately, annual information by commodity is not readily available from that database, and summary information is not presented in a recent NFA annual report.

Several observers have commented that the NFA database yields higher values than the Customs database. For example, in an NFA paper (Usu et al. 2015) states that the value of tuna exports in 2014 was around US\$218 million (K560 million), whereas the total marine product exports in 2014 in the table above is K345.9 million. A similar discrepancy was noted in the Gillett (2009) study, and more recently in a study sponsored by the European Union (Hamilton et al. 2011). Possible reasons for the discrepancies include differences in accounting for re-exports (tuna/mackerel imported for canning and later exported), and differential effectiveness in monitoring large volumes of export documentation.

PNG's most important fishery export commodity is tuna. A recent study examines the PNG tuna processors and their local and overseas markets. The summary results are shown in Table 14-11.

Table 14-11: Products and Markets of Tuna Processors in Papua New Guinea

	Products	Export Markets for Processed Products	Local/Regional Market
RD Tuna Processors	Canned tuna, primarily skipjack but some yellowfin Cooked loins – mostly yellowfin, but some skipjack fish meal	70% canned tuna to EU (Germany, UK, Netherlands, Denmark, others); private label; Chunks/solid/flakes in oil/brine Cooked loins: EU (Spain, Italy), mostly yellowfin	30% canned tuna production sold mostly in PNG, some to Vanuatu, Solomon Islands. Own label, various grades including red meat
Frabelle Corp.	Canned tuna, primarily skipjack, but some yellowfin Cooked loins – mostly yellowfin, but some skipjack fish meal	80% canned tuna production to EU (Germany, UK, Netherlands, others); private label; Chunks/solid/flakes in oil/brine; Cooked loins: EU (Spain, Italy) mostly YF	20% canned tuna production sold in PNG Own label; canned in oil, fancy packs, red meat
SSTC	Cooked loins: skipjack and yellowfin	98% of cooked loins to EU (Spain), Thailand. Small volume to US (Bumble Bee)	No local sales; Occasionally red meat shipped to other canners in PNG
IFC	Skipjack and some yellowfin	Not available	Not available, but believed to be very small
Majestic Seafoods	Canned tuna and loins	All exported to EU	Not available

Source: McCoy et al. (2015) and M. Brownjohn, (per. com. January 2016)

## 14.4 Government Revenue from Fisheries

### Access Fees for Foreign Fishing

Information on access fees for foreign fishing is not readily available from NFA. A considerable amount of investigation was required to estimate the access fees. The available documentation was examined, presentations by NFA staff at international meetings were studied, and people knowledgeable about PNG access fees were interviewed, especially past employees of NFA, fishery consultants and staff of regional organisations involved in fisheries. The following features were examined: fees to PNG from the US tuna treaty, the number of vessel day scheme (VDS) days allocated to PNG, the distribution of days among various fleets, benchmark prices for those VDS days, information on reductions in fees for PNG-based fishing companies

and other entities, provisions for fees for vessels operating under the FSM Arrangement, estimates of PNG access fees by other agencies, and news in the media on payments by NFA to the PNG government.

Using the above information types to estimate recent PNG access fees could easily lead to poor estimates, however, conversely, advancing an “educated” guess may encourage others to produce better assessments. Accordingly, it is estimated that the 2013 PNG access fees were US\$44 million (K113.1 million), and the 2014 PNG access fees were US\$85 million (K218.5 million).

The revenue and grants of the PNG government budget were K12,675 million in 2014 (Department of Treasury 2015). The 2014 access fees therefore equated to 1.7% of the revenue and grants for the year.

As mentioned above, offshore fishing in PNG in 2014 (and to some degree the associated access fees) was somewhat atypical. 2014 was an El Niño year, and purse seine catches characteristically move eastwards during El Niño periods (i.e. towards the Kiribati zone), and consequently the desirability of access to the PNG zone is reduced.

The NFA website<sup>6</sup> contains information about future access fees: “The revenues from access fees will decrease in the coming years as the government continue to promote onshore processing of our tuna resources. The benefits of onshore processing will be in the form of employment, tax returns and spin-off businesses.”

## Other Government Revenue from Fisheries

A limited quantity of information is available on government revenue from the fisheries sector, other than access fees. In the past the NFA annual reports gave the “domestic license fees received by NFA” and “other fees received by NFA”.

The NFA Deputy Managing Director indicated that the tuna sector generates revenue from application fees, observer fees and training levies (L. Kumoru, per. com. August 2015).

A substantial amount of tuna transshipment occurs in PNG, and several other Pacific Island countries derive revenue by taxing transshipments. According to McCoy (2012), PNG does not charge transshipment fees, but harbour fees and cost recovery of monitoring services are applied. (M. Brownjohn, per. com. January 2016)

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6 [www.fisheries.gov.pg/FisheriesAuthority/NFAPaysK50MDividendPaymenttotheGovernment/tabid/335/Default.aspx](http://www.fisheries.gov.pg/FisheriesAuthority/NFAPaysK50MDividendPaymenttotheGovernment/tabid/335/Default.aspx)

## 14.5 Fisheries-Related Employment

Three reports summarise the situation with respect to participation in the subsistence fisheries of the country. Although those studies use data from the 1990s, it is unlikely that the circumstances have changed significantly:

- UNDP (1994) indicates that the coastal fishing population (those who are involved in some fishing activity at least once a week) is about 120,000. People involved in freshwater fishing (those who do some fishing at least once per week) number somewhat less than 125,000.
- Preston (2001) summarises much of what has been written on the subject in recent years: “Despite the widespread nature of subsistence fishing, in many instances it is sporadic, as most food production continues to be derived from agriculture. Nevertheless a large number of people, estimated at somewhere between 250,000 and 500,000, participate in the coastal subsistence fishery. The 1990 census estimated that 130,963 households, which is 23% of all rural households in the country, were engaged in catching fish (both marine and fresh water fishing). Of these households, 60% said they caught fish for home consumption only, while 40% caught fish both for food and for sale. A significant proportion of households were involved in fishing in all Provinces except those in the highlands. The highest proportion of fishing households occurred in Milne Bay (14.3% of households), East Sepik (11.3%) and Madang (10.0%).”
- Avalos (1995) comments on the gender aspects of participation in PNG’s subsistence fisheries: “Women’s role in fishing is much larger than is generally acknowledged. According to the Women’s Sector Review, studies have shown that at women catch at least 25% of the subsistence catch, or more if the crab catch is added. Furthermore they are dominant in the processing stage of small-scale fisheries and contribute to the marketing of fish where the husband is involved in catching”.

Some of the above information has become institutionalised. For example, ADB (2014) indicates that, in PNG, 120,000 people are involved with capture fisheries (without source attribution). It appears that there has been no substantial research undertaken into participation in PNG subsistence fisheries at the national level for the past two decades. The readily available documentation from the latest national census (NSO 2012) does not contain the word “fish”. The most recent PNG household income and expenditure survey has not been analysed for fishery participation information.

SPC's ProcFish programme surveyed four sites in PNG (Friedman et al. 2008). Table 14-12 is an extract from the report of the survey showing the importance of both reef fisheries and the sale of fish. The ProcFish sites are not representative of all sites in PNG, but rather an attempt was made to choose sites that are typical of coastal locations with active marine fisheries.

Table 14-12: Involvement with Fisheries at the ProcFish Sites

Site	% Households involved in reef fisheries	% Households with fisheries as most important source of income
Andra	100	50.0
Tsoilaunung	100	50.0
Sideia	100	70.0
Panapompom	100	43.3
Average across the four sites	100	53.3

Source: Friedman et al. (2008)

The number of people employed in small-scale commercial fishing in PNG has never been adequately surveyed, and many of the current estimates are at least partially based on a UNDP fisheries sector study in the late 1980s. Diffey (2005), using several sources, summarises the current state of knowledge: "In 1989 UNDP estimated that PNG had about 2,000 coastal village communities with a population of about 500,000 people. Of these it was estimated that 120,000 were involved in regular fishing activity at least once a week and that there were between 2,000 and 4,000 part-time artisanal fishermen. These data are confirmed by the 1990 population census where NSO estimated that, of 131,000 coastal rural households, 23% (30,000) were engaged in catching fish with 60% fishing purely for subsistence consumption and 40% for both food and for sale".

The corporate statement of the National Fisheries Authority (NFA 2015) mentions the employment that the NFA has helped create:

Within the last 14 years, the National Fisheries Authority has accomplished fisheries development and infrastructures, impact projects, processing plants, aquaculture developments, research facility, capacity building and international fisheries cooperation/agreements. For the fisheries sector alone, this is a massive milestone achievement for Papua New Guinea, creating employment for more than 30,000 Papua New Guineans and providing income earning opportunities of nearly K10 million a year to ordinary Papua New Guineans.

The NFA itself provides direct employment. Govan et al. (2013) states: “The overall NFA Staffing stands at 170 and the National Fisheries College (NFC) stands at 22. There are 9 inshore Fisheries staff assigned in Port Moresby. A full staff structure is not available for NFA. Provincial Fisheries Offices have between 4 and 12 staff coming to a total of 77 staff in the 9 maritime provinces for which there are data”. In addition, the fishery observer programmes employ about 350 people under contract to NFA.

The PNG tuna industry is a large employer, in both processing and fishing components. Box 14-3 summarises the tuna processing- employment situation.

#### **Box 14-3: Employment in PNG Tuna Processing**

The largest segment of employment of PNG nationals in the tuna sector is in tuna processing. Much of the impetus in fostering tuna industry development in PNG has come from recognition of the need for increased employment in a country with chronic unemployment, pervasive underemployment and dismal development indicators. Various estimates have stated the level of direct employment provided by tuna processing plants in the country during the period 2011—2012 as being from 5,800 to nearly 7,000 people. A 2012 report gave the total as around 6,700, 98 percent of whom were PNG nationals.

Taking stated production levels and employment for the three canneries, it is estimated that for daily production of up to around 150 tons (the average maximum processed so far by any one facility) an average of 20—24 employees are required for each ton of tuna processed.

The labor-intensive nature of work within tuna processing facilities and difficult working conditions (i.e. standing for long periods each day, working in hot/damp conditions), results in canneries actively seeking young, fit workers with an emphasis on those between 18—35 years of age. The maximum age for production-line workers in PNG is said to be around 45.

In July, 2014 a new minimum wage requirement became effective in PNG. The new rate is pegged at K3.20 (US\$1.17 in March, 2015). It is estimated that total annual gross wages that will be paid under the new requirement is on the order of K35 million to K40 million (US\$12.8 million to US\$14.6 million).

Experience in large industrial tuna processing investments in PNG so far (RD, SSTC, Frabelle, Majestic) demonstrates that access to PNG's tuna resources is the main driver behind investment. Companies investing in the PNG tuna industry do so to achieve core business interests, and this includes investing to secure long-term access to resources. In the past all companies have limited production costs by reducing the percentage of catch processed in PNG and by keeping wages low. This keeps them competitive in the global industry, which in turn shapes the nature of tuna-based development in PNG. New requirements to process greater amounts of catch within PNG will test the viability of processors, some of which are already calling for additional government support to offset their higher costs of doing business in the country.

Other estimates of the number of jobs generated by the tuna industry are summarised below:

- The PNG submission to the 2015 meeting of the Scientific Committee of the WCPFC (Usu et al. 2015) stated: “Currently, the industry supports almost 7,000 people in direct employment and almost 2,000 indirect employments in the country of over 6 million people. New commitments and investments would triple these figures.”
- Pokajam (2012) estimated there were 11,600 people directly employed in the four tuna processing plants that existed in 2012, plus an additional 34,800 indirect tuna-related jobs.
- An EU-sponsored study (Hamilton et al. 2011) estimated that tuna processing in 2010 provided 6,534 direct jobs and 16,335 indirect jobs.
- The Forum Fisheries Agency has an a project – Economic Indicators Programme – that collects data on tuna-related employment in standardised form: FFA (2015) contains information on the employment of people from PNG in the tuna industry (see Table 14-13). That document states a total of 9,312 people from PNG were employed in the tuna industry in 2014.

**Table 14-13:** Tuna-Related Employment in PNG (number of people employed)

	2009	2010	2011	2012	2013	2014
Processing and ancillary	5,783	5,600	5,962	6,640	7,000	7,536
Local crew	1,102	1,102	1,153	1,509	1,776	1,776
<b>Total</b>	<b>6,885</b>	<b>6,702</b>	<b>7,115</b>	<b>8,149</b>	<b>8,776</b>	<b>9,312</b>

Source: FFA (2015)

The above tuna-related employment can be viewed from both regional and national perspectives. Across the Pacific in 2014 a total of 17,663 people were employed as crew on tuna vessels or in tuna processing and ancillary work (FFA 2015). The tuna industry employment in PNG (about 9,315 people according to FFA) represents 52.7% of the regional tuna-related employment. Nationally, about 774,000 people in PNG have “monetary employment” (FAO 2011). Tuna-related employment therefore represents about 1.2% of the monetary employment in the country.

A study by the Asian Development Bank (ADB 2014) provides some insight into the role of women in fisheries and the associated challenges, as follows:

In PNG, studies have shown that women's fishing efforts supply an estimated 20% to 50% of catches annually in some areas. Under the influence of the cash economy, women's position is being usurped through changing values and a breakdown of traditional social structures. Women are very much involved in harvesting, processing, and marketing but poorly represented at management levels or at meetings or planning processes. Because women do contribute significantly to the overall marine resources harvested, any attempt to develop a fishery or coastal resource management program will need participation of women as equal partners with men. With concern over depletion of inshore marine resources due to habitat loss and overharvesting, fisheries departments in the Pacific are encouraging offshore fisheries, for example by providing gear and training. Unfortunately, experience shows that women receive little or none of the benefits from such programs.

SPC (2013) uses ProcFish data to examine the ratio of men to women fishers across the Pacific. For the PNG sites examined, about 42% of fishers are men and 58% are women. PNG is one of the few countries in the ProcFish study where, at the sites examined, women represent more than half of fishers.

It appears that gender in the PNG tuna industry has received much attention. An FFA study (McCoy et al. 2011) quantified employment in tuna processing by sex and other attributes (Table 14-14).

**Table 14-14:** PNG Tuna Processing Summary Labour Profile, 2011

Attribute	Quantification
Total number of employees	6703
Total number of expatriate workers	151 (2%)
Total number of female employees	4911 (73%)
Percentage of PNG nationals in 73 management-level positions	18%
Percentage of PNG nationals in 272 supervisory positions	70.5%
Percentage of PNG nationals in unskilled positions	100%

Source: McCoy et al. (2015)

An SPC study on gender in the tuna industry (Sullivan and Ram-Bidesi 2008) indicated that about 7,000 women worked in the PNG tuna industry, including onshore handling and loining or canning, and technical and administrative positions. The study concluded that the tuna industry employed 3.3% of all formally employed women in the country. Further information from the study is given in Box 14-4.

**Box 14-4: Women in the PNG Tuna Industry**

The National Fisheries Authority (NFA) was established by the Fisheries Management Act of 1998 to replace the former Department of Fisheries and Marine Resources. Women are involved within the NFA in several types of roles, including surveillance, enforcement and monitoring. According to the Secretary to Corporate Services, there are 33 female employees at all levels in the NFA out of a total of 91 staff. Women have also found employment in fisheries related business administration and provide legal, scientific, and technical services to private and government fisheries institutions. There are no specific employment figures for such workers but the authors estimate no more than 1,000 women are employed in service industries related to the fisheries sector. This does not include the large number of PNG women involved in fish processing. The actual harvesting of tuna is largely a male domain in Papua New Guinea and there are no women currently working on commercial tuna vessels. The contribution of women to the tuna harvesting sector (purse seine, pump-boat and longliners) is therefore negligible, as very few actually handle fish at the ports, notably at RD Tuna's Vidar wharf. Women work in marketing fish at all levels, from roadside stalls to the export of tuna sashimi products. The potential for expanding women's roles in the industry is primarily in the processing and marketing stages, where diversifying value added strategies, expanding overseas markets, and enforcing gender equity legislation will produce more jobs for women. Greater credit opportunities, under relaxed criteria, will also bring more women into the industry.

The findings from this country study reveal that, whilst women have benefited from entry into the formal economy through the tuna industry, most of the opportunities exist primarily at the lower wage range in processing plants in Madang, Lae and Port Moresby. Because these jobs are in great demand, market forces have not resulted in the processing companies paying much attention to important health, safety, transport and wage concerns that prevail. This lack of current attention, and unlikely possibility of spontaneous improvement, appears to justify at least some government intervention to mitigate the problems.

Source: Sullivan and Ram-Bidesi (2008)

## 14.6 Levels of Fishery Resource Consumption

Preston (2001) summarises the earlier information on fish<sup>7</sup> consumption in PNG, as follows:

- Most documents and reports on nutrition in PNG focus on agriculture and animal husbandry, and pay little attention to fish. Nevertheless fish play an important role in food security, particularly in certain areas. On average, Papua New Guineans were estimated (Gibson 2000) to

<sup>7</sup> Preston (2001) uses the term "fish" to describe freshwater and marine finfish, shellfish and other aquatic food products.

have consumed 10 kg of fresh, frozen or dried fish per capita, with a total value of K 60 million, in 1996. Urban dwellers had higher per capita consumption rates than rural dwellers (21 kg as opposed to 8 kg) but consumed less total value of fish (K26 million versus K34 million kina) due to their smaller numbers.

- In addition to fresh fish and seafood, tinned fish is an important source of dietary protein for many people. Gibson (2000) estimates that on average Papua New Guineans consumed 3 kg per capita of tinned fish, valued at 63 million kina, in 1996. Again urban dwellers had a higher per capita consumption than rural people (7 kg as against 2 kg), but consumed a lower total value.
- Most of the fish and seafood consumed in Papua New Guinea is domestically produced, including tinned fish. After accounting for seafood imports and exports, the apparent per capita seafood consumption<sup>8</sup> has been estimated by Preston (2000) to lie between 18.2 kg per year and 24.9 kg per year.
- Together fresh and tinned fish provide a small but important source of high-quality protein in the Papua New Guinean diet. Gibson (2000) estimates that fresh fish provides about 1.1% of average calorific intake to the average Papua New Guinean (0.9% in rural areas and 2.3% in urban areas) while tinned fish provides an average of 0.6% (0.5% in rural areas, 1.4% for urban dwellers).

Bell et al. (2009) use information from household income and expenditure surveys conducted between 2001 and 2006 to estimate patterns of fish consumption in Pacific Island countries. The HIES were designed to enumerate consumption based on both subsistence and cash acquisitions. For PNG the per capita fish consumption (whole weight equivalent) was 28.1 kg per capita per year in urban areas (fresh fish made up 76% of this amount) and 10.2 kg per capita per year in rural areas (77% fresh fish).

SPC's ProcFish programme carried out survey work at four sites in PNG (Friedman et al. 2008). That work included estimations of per capita fish consumption. The results of this work are shown in Table 14-15.

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<sup>8</sup> Apparent consumption is the composite of domestic production (subsistence and commercial) plus imports, less exports.

**Table 14-15:** Fishery Product Consumption at ProcFish Sites (kg/person/year)

Village	Fresh fish consumption	Invertebrate consumption	Canned fish consumption
Andra	35.66	6.54	11.79
Tsoilaunung	35.11	11.28	6.88
Sideia	23.95	9.47	5.64
Panapompom	37.39	1.77	2.70
Average across the four sites	33.77	7.02	5.13

Source: Friedman et al. (2008)

The following summarise some general aspects of fish consumption in PNG:

- The 1996 HIES indicated that the consumption of fish (fresh, frozen and dried, including shellfish) was 10 kg/person/year. In urban areas it was 21 kg and in rural areas it was 8 kg.
- NFA (2015) states that, for the coastal and island areas of PNG, estimates of annual fish consumption per capita range from 4.8 kg to 24.9 kg.
- Pilling et al. (2015) show that the non-target bycatch from off-shore fishing in PNG amounts to 1,393 mt annually in the period 2008–2010. Nationally, this equates to a potential supply of 0.268 kg/person/year.
- ADB (2014), using FAO data, shows that in PNG fish provides about 6.9% of the total protein supply for the country.

The consumption of canned tuna in PNG is increasing. Table 14-16 (from Hamilton et al. 2011) shows the increase over a five-year period.

**Table 14-16:** The PNG Domestic Market for Canned Tuna, 2006–2010 (mt)

Year	Domestic Production	Imports	Total
2006	6,600	3,738	10,338
2007	7,800	5,056	12,856
2008	6,000	4,597	10,597
2009	7,500	3,609	11,109
2010	9,500	5,566	15,066

Source: Hamilton et al. (2011)

## 14.7 Exchange Rates

The average yearly exchange rates (PNG Kina (Kw) to the US dollar) used in this book are as follows:

2007	2008	2009	2010	2011	2012	2013	2014
2.96	2.77	2.65	2.63	2.13	2.07	2.42	2.57