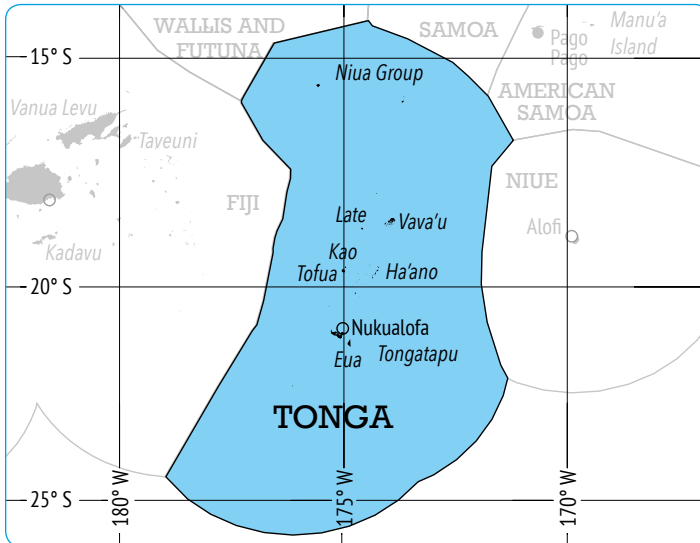


17 Tonga



17.1 Volumes and Values of Fish Harvests in Tonga

Coastal Commercial Catches in Tonga

The Fisheries Division of the Tongan government does not estimate total coastal fisheries production, but rather only estimates the volumes and values of the throughput of certain fish markets and of exports. Historical attempts to estimate coastal fisheries production in recent years have been as follows:

- Dalzell et al. (1996), in the early 1990s, estimated that subsistence production was 933 mt, worth US\$1,901,208, and that the coastal commercial production was 1,429 mt, worth US\$2,806,641.
- The Tonga Statistics Department, using a household income and expenditure survey (HIES), determined that the value added for local market fisheries in the late 1990s was T\$9,090,000 (Tongan Pa'anga), and for

non-market fisheries was T\$5,108,000 (Tonga Statistics Department unpublished data). This value added equates to 2,863 mt for non-market fisheries and 3,561 mt for local market fisheries.

- Gillett and Lightfoot (2001) estimated that, in the late 1990s, the coastal fisheries production consisted of subsistence of 2,863 mt, worth T\$6,385,000, and coastal commercial of 4,173 mt, worth T\$17,362,500.
- Gillett (2009) considered the above studies and examined the results of the 2000/2001 household income and expenditure survey. The results of the HIES gave volumes and values of coastal fisheries production that seemed too low and were rejected, for a number of reasons, including: (1) for some years the free-on-board (FOB) value of exports from Tonga's coastal fisheries were much greater than the HIES estimated for all commercial coastal fisheries; and (2) discussions with an HIES specialist at SPC suggested that the Tonga HIES seriously underestimated subsistence fishing (G. Keeble, per. com. September 2008). It was decided that the most appropriate option for estimating fishery production would be to adjust the Gillett and Lightfoot (2001) estimate by changes in population, coastal fisheries exports, imported food and the price of fish. The 2009 Gillett study subsequently estimated a production in 2007 from Tonga's coastal commercial fisheries of 3,700 mt (of which about 700 mt was exported), worth about T\$22,800,000 to the producer. Following a similar extrapolation approach for subsistence fisheries, a 2007 production of about 2,800 mt, worth T\$12,488,000 was also estimated.

A study by the International Union for the Conservation of Nature (IUCN) that has considerable relevance to valuing the benefits from coastal fisheries in Tonga was recently carried out under the MacBio Programme (Salcone et al. 2015). This work is described in Box 17-1.

Box 17-1: Economic Assessment and Valuation of Marine Ecosystem Services

The MacBio project has undertaken national economic assessments of marine and coastal ecosystems in... five Pacific Island countries: Solomon Islands, Kiribati, Fiji, Vanuatu, and Tonga. The principal objective of the economic component of MacBio was to help countries to identify, quantify and, as far as possible, value in monetary units the most relevant marine and coastal ecosystem services in each MacBio country.

[The] report of the assessment describes, quantifies and, where possible, calculates the economic value of Tonga's marine and coastal resources. Seven key marine ecosystem services are evaluated in detail: subsistence and commercial fishing; minerals and aggregate mining; tourism; coastal protection; carbon sequestration; and research, management and education. Others services are explored as well, including cultural and traditional values associated with the sea, potential future industries and other human benefits that have not yet been analysed or exploited.

Source: Salcone et al. (2015)

The MacBio Tonga fishery results can be placed in three categories:

- For *subsistence fisheries*, a household income and expenditure survey was carried out in Tonga in 2009 (Statistics Department 2010), and the Tonga Statistics Department used that HIES data to estimate a value added from subsistence fisheries. The MacBio study used that information, combined with some data from other studies (i.e. cost of fishing), to estimate the gross annual value of subsistence fishing in Tonga at between T\$6,063,000 and T\$10,914,000 per year. Using an average price of seafood of T\$8.27/kg from the 2014 market surveys by the Fisheries Division, that value equates to between 733 mt and 1,320 mt of fishery products.
- For *small-scale coastal commercial fishing*, the MacBio study uses expenditure on seafood (T\$9,132,000) and household income from fishing (T\$8,339,000), together with seafood prices (T\$8.27 and T\$5), to estimate commercial production of between 1,008 mt and 1,826 mt.
- For *export-oriented coastal fisheries*, the MacBio results show values added for: (a) beche-de-mer of T\$450,000, based on export prices and a 50% value-added ratio; (b) aquarium products of T\$250,000, based on prices minus various taxes and estimated operating costs; and (c) deep-slope fisheries of T\$230,000, based on the gross value of exports and non-exports and a 20% value-added ratio.

The MacBio study and the present study have different objectives and, accordingly, the way the data are treated and presented sometimes vary. These differences include the following:

- The MacBio study presents the value added of the subsistence and commercial production, whereas the present study presents the imputed farm-gate values (for subsistence) and gross value to fishers (for commercial).
- The focal year for the MacBio study is 2013, while 2014 is the focal year for the present study.
- The present study considers the deep-slope fishery to be a component of the coastal commercial fisheries.

The analysis in the MacBio methodology can be considered quite thorough. The results, however, indicate a much smaller production level than the levels revealed by the other recent studies. This could be because of the MacBio's reliance on the 2009 HIES (or the Statistics Department's analysis of the HIES data), or because it applied the average 2014 Tongatapu retail price of fish to HIES data to obtain the volume of production. As stated above, the Gillett (2009) study rejected the 2001 HIES for estimating fishery production in Tonga. Kelleher (2015) shows that the adjusted expenditure on marketed fish in the 2001 HIES (T\$8,820,000) is almost identical to the adjusted expenditure in the 2009 HIES (T\$8,836,000), which casts further doubt on using the Tonga HIES data for estimating fishery production. Furthermore, the Tonga Statistics Department does not use the HIES for estimating the value of marketed fish for GDP purposes (see the GDP section below). The Tonga 2009 HIES is not a "fisheries-friendly" HIES – the new HIES being promoted by SPC is far more "fisheries friendly" (i.e. of the type explained in the FSM section of this book).

As for applying the Tongatapu prices to all fish sales in Tonga, discussions during the present study with fisheries officers and fishers with experience in Vava'u and Ha'apai indicate that prices in those locations are about 60% of the Tongatapu retail prices. Previous studies (e.g. Lautaha and Cohen 2004) suggest that a substantial portion of fish for sale in Tongatapu actually comes from Vava'u and Ha'apai. The distortion caused by high pricing is recognised in the report of the MacBio study:

The price estimate used to calculate harvest quantity (T\$8.27/kg) reflects 2014 prices in Tongatapu markets. This is likely higher than the national average, and is more than three times higher than estimates used by Gillett and Lightfoot in 2001. Dividing gross values by a high price of fish per kilogram will underestimate the total harvest. Using a replacement cost of seafood of T\$5/kg would increase harvest estimates to 40%. (Salcone et al. 2015, p. 32).

Given the concerns about using the HIES data to obtain coastal fishery production information, the approach taken in the present study is to enhance the Gillett (2009) estimate by taking into account additional information and developments in the period from 2007 to 2014 that are likely to have affected coastal fisheries production.

The following further information and developments were considered in the present study:

- According to fisheries stakeholders, inshore fisheries production in Tonga has been relatively stable, with few shocks, with the exceptions of: (a) a cyclone in early 2014 that caused significant damage in Ha'apai; and (b) an increase in fish aggregation devices in about 2011 (S. Mailau, P. Mead, per. com. September 2015).
- The population of Tonga increased 1.1% in the period 2007 to 2014, and there was an increase in the rate of population movement from Vava'u and Ha'apai to Tongatapu (SPC PRISM website information).
- The beche-de-mer fishery remained closed in 2007. A harvesting boom occurred in 2009, in which exports reached 318 mt, followed by a crash in 2011. In 2014 there was a moderate recovery, with exports of about 140 mt.
- The import of protein alternatives to fish increased. Animal food imports to Tonga were US\$15.3 million in 2007, and US\$24.9 million in 2014 (www.WITS/worldbank.org).
- Production of the deep-slope fishery was relatively steady, with 14 licensed vessels in 2007, 20 in 2009, and 14 in 2014 (ACP 2013, T'Ahoafi, per. com. September 2015).
- The number of special management areas (SMAs) increased, from three in 2008 (Gillett 2009) to eight in 2014 (S. Mailau, per. com. September 2015).
- In nominal terms the value of fish exports increased, along with the domestic price of fish (Table 17-1).

Table 17-1: Changes in Fish Exports and the Price of Fish

	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
Fish exports in current prices (T\$ thousands)	5,921	4,159	9,857	9,904	9,605	9,082
CPI fish (2010-11 = 100)	78.72	82.19	85.35	97.74	100.00	111.05

Source: Tonga Statistics Department, as cited in Kelleher (2015)

An examination of the above change factors suggests that, overall, there was no radical change during the period 2007 to 2014 in the production from Tonga's coastal fisheries. The most likely scenario appears to be a moderate increase in the volume and a slightly greater increase in the value of coastal fisheries.

It is estimated that, in 2014, Tonga's coastal commercial fisheries produced 3,900 mt of fish, worth T\$33.6 million to fishers. However, the poor factual basis of this estimate should be recognised.

Coastal Subsistence Catches

Following from the above discussion, it is estimated that the production from coastal subsistence fisheries in Tonga in 2014 was about 3,000 mt, worth T\$18.7 million to fishers. The poor factual basis of this estimate should be recognised.

Locally Based Offshore Catches

According to the Fisheries Division and industry sources, during 2014 there were a total of 10 Tonga-based longliners. These were all based in Nuku'alofa, and the fleet consisted of four Tongan vessels and six foreign vessels (T. Tavakai, E. Palu, per. com. September 2014). According to the Tonga National Tuna Fisheries Management and Development Plan (Fisheries Division 2015a), by the end of 2014 there were nine vessels: four local vessels and five foreign vessels. The Tonga submission to the August 2015 Scientific Committee of the Western and Central Pacific Fisheries Commission [WCPFC] (Fisheries Division 2015b) states that, in 2014, "100% of the fishing effort of the National longline fleet took place within the Tonga EEZ".

The available information shows the following:

- The total offshore tuna catch in the Tonga zone in 2014 was 679 mt, of which Tongan-flagged vessels caught 243 mt (Forum Fisheries Agency [FFA] 2015)
- The above indicates that the foreign tuna catch in the Tonga zone in 2014 was 1,436 mt.
- The WCPFC submission states that the 243 mt tuna catch was accompanied by 228 mt of non-target and bycatch species.
- Neither the FFA data nor the Tongan WCPFC submission partitions the foreign catch into that made by foreign-based vessels and that made by Tongan-based vessels.

To estimate the catches made by Tongan-based vessels, some assumptions must be made. It is stated above that six foreign vessels were based in Tonga in 2014. The Tongan WCPFC submission states: "In 2014, a total of 19 foreign flagged longline vessels had valid license to fish in the Tonga EEZ." For the purpose of estimating locally based catches, it will be assumed that the locally based foreign vessels caught 32% (6 local vessels divided by 19 total vessels) of the total foreign catch in the Tonga zone. This equates to 460 mt of tuna for locally based foreign vessels.

The total 2014 tuna catch by Tonga-based vessels was therefore 703 mt (i.e. 243 mt Tongan, 460 mt foreign). Assuming the same bycatch proportion for the Tonga-based foreign vessels, the total catch (tuna plus bycatch) for all locally based vessels is estimated to be 1,363 mt.

Using pricing information in FFA (2015) and adjusting for transport to destination markets (i.e. to equate to Tonga in-zone prices) the 2014 locally based offshore tuna catch is estimated to be worth T\$4,470,000. Assuming the bycatch was all sold in Tonga at T\$5/kg, the bycatch was worth T\$3,300,000. The total 2014 offshore catch made by Tonga-based vessels is therefore estimated to be 1,363 mt, which was worth T\$7,770,000 to fishers.

Foreign-Based Offshore Catches

Following from the discussion above, on locally based offshore catches, the foreign tuna catch in the Tonga zone in 2014 was 1,436 mt, of which 460 mt were made by Tonga-based vessels. This indicates a tuna catch in the Tonga zone of 976 mt by foreign-based vessels. Assuming the same 2014 bycatch rate as for Tongan-based vessels, the total catch by foreign-based offshore vessels (i.e. tuna plus bycatch) was 1,891 mt.

Using pricing information in FFA (2015), and adjusting for transport to destination markets (i.e. to equate to Tonga in-zone prices), the 2014 foreign-based offshore tuna catch is estimated to be worth T\$6,205,000. Assuming the bycatch is worth T\$3.50/kg to fishers, it was worth T\$3,203,000.

It is estimated that, in 2014, catches by foreign-based offshore vessels in the Tonga zone were 1,891 mt, worth T\$9,408,000 to fishers.

Freshwater Catches

The freshwater catches in Tonga are extremely small, because of the lack of large freshwater bodies. The Tonga Fisheries Resource Profiles (Bell et al. 1994) makes no mention of freshwater fish or fisheries, but the Tonga Fisheries Bibliography has a section called “Fresh and Brackish Water” (Gillett 1994).

Catches of fish in fresh water appear limited to tiny quantities of tilapia in small lakes in the three northern island groups of the country. It is reported that a small stream on ‘Eua Island has freshwater shrimp (J. Fa’anunu, per. com. November 2008). Tilapia was introduced into some of the wells on Ha’ano Island in Ha’apai (Thaman et al. 1995).

The Tonga 2014 freshwater fish catch is deemed to be 1 mt, worth T\$6,000.

Aquaculture Harvests

Currently, significant aquaculture production in Tonga is limited to giant clams and pearls. There is also farming of milkfish, seaweed, coral and sea cucumber, but on a very small-scale or experimental basis.

The Aquaculture Development Plan (Ministry of Fisheries 2010) states: “Most, if not all, of the giant clam seed stock is produced at the government mariculture facility at Sopu. Approximately 5,000 pieces worth T\$17,500 are exported per year”. Convention on International Trade in Endangered Species (CITES) export records show that much less than this figure was exported in 2013: 791 individual giant clams. The Head of Aquaculture Research and Development at the Fisheries Division indicated that, in 2014, about 600 giant clams were sold, at a price of T\$5 apiece. All of these were sold to aquarium fish dealers for subsequent export. (P. Ngaluafe, per. com. September 2015)

The Aquaculture Development Plan indicates that low-level *Pteria* pearl oyster farming occurs at Vava’u. Oysters are hung using submerged longline techniques. The oysters are either collected from the wild or are harvested from artificial spat collectors. In some cases, a half-pearl “mabe” is inserted on the inside shell valve. The oysters are harvested for their mother-of-pearl shell, and used for handicrafts that are sold. The Head of Aquaculture Research and Development at the Fisheries Division indicated that, in 2014, about 500 pearls (all mabe) were sold at a farm gate price of T\$50 per pearl.¹ (P. Ngaluafe, per. com. September 2015)

¹ As this price is significantly greater than round pearls produced in Tahiti and the Cook Islands, its validity was the subject of an inquiry to the Head of Aquaculture. That person confirmed the price of T\$35.

Based on the above information, it is estimated that the 2014 aquaculture production in Tonga was 1,291 pieces, with a farm gate value of T\$28,000.

Summary of Harvests

From the above sections, a crude approximation of the annual volumes and values² of the fishery and aquaculture harvests in Tonga in 2014 can be made (Table 17-2).

Table 17-2: Annual Fisheries and Aquaculture Harvest in Tonga, 2014

Harvest Sector	Volume (mt, and pcs where indicated)	Value (T\$)
Coastal Commercial	3,900	33,600,000
Coastal Subsistence	3,000	18,700,000
Offshore Locally based	1,363	7,770,000
Offshore Foreign-based	1,891	9,408,000
Freshwater	1	6,000
Aquaculture (pcs)	1,291 pcs	28,000
Total	1,291 pcs and 10,155 mt	69,512,000

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

² The values in the table are dockside/farm gate prices.

Figures 17-1 and 17-2 show the volumes and values of the 2014 Tonga fisheries production. Aquaculture is not shown on the volumes figure, due to the use of mixed units (pieces and mt).

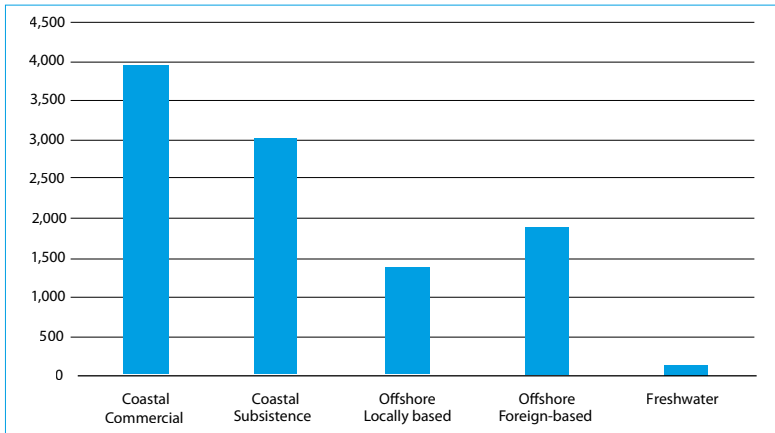


Figure 17-1: Tonga Fisheries Production 2014 by Volume (mt)

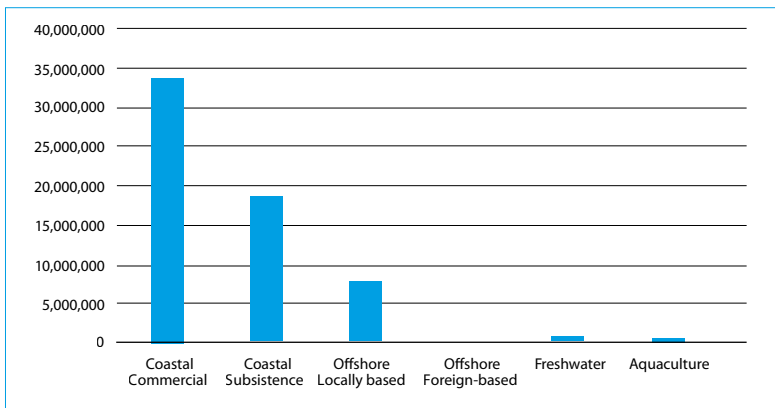


Figure 17-2: Tonga Fisheries Production 2014 by Value (T\$)

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 Tonga from those three studies are presented in Table 17-3.³

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

Table 17-3: Estimates by the Benefish Studies of Annual Fisheries/Aquaculture Harvests

Harvests Sector	Estimate Year	Volume (mt, and pcs where indicated)	Nominal Value (T\$)
Coastal Commercial	1999	4,173	17,362,500
	2007	3,700	22,800,000
	2014	3,900	33,600,000
Coastal Subsistence	1999	2,863	6,385,000
	2007	2,800	12,488,000
	2014	3,000	18,700,000
Offshore Locally based	1999	800	5,880,000
	2007	1,119	6,224,625
	2014	1,363	7,770,000
Offshore Foreign-based	1999	45	166,000
	2007	0	0
	2014	1,891	9,408,000
Freshwater	1999	n/a	n/a
	2007	1	4,000
	2014	1	6,000
Aquaculture	1999	n/a	n/a
	2007	12,334	37,000
	2014	1,291 pcs	28,000

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

17.2 Contribution of Fishing to GDP

Current Official Contribution

The National Accounts Statistics (Statistics Department 2015) give the total fishing contribution to GDP. Staff of the Statistics Department kindly disaggregated the total fishing contribution into its three components. The results are given in Table 17-4.

Table 17-4: The Official Fishing Contribution to Tonga GDP

	2011/2012	2012/2013	2013/2014
Fishery sector: Local market component	9.9	8.2	7.8
Fishery sector: Non-market Component	5.9	4.9	4.7
Fishery sector: Export component	5.0	7.4	5.6
Total Fishing	20.8	20.6	18.2
Tonga GDP (market prices)	800.7	779.1	803.7
Fishing as % of Tonga GDP	2.6%	2.6%	2.3%

Notes: GDP at current prices; units: T\$ millions

Source: Statistics Department (2015), and M. Masila (per. com. September 2015)

Method Used to Calculate the Official Fishing Contribution to GDP

According to the staff of the Statistics Department, the general method for calculating sector contributions to GDP, including that from fishing, has been used for many years – with the only change recently being the benchmark year, which is now 2010. The method used for fishing is to sub-divide the sector into three components:

- **Local market.** This category covers the fish that are caught for sale as food. The Statistics Department indicated that a production approach is used to estimate the value added by the locally marketed sub-sector. The initial data were obtained by surveying “some private businesses”. This value is updated by extrapolation, based on population, consumer price index (CPI) and a disaster index. Twenty percent of the gross value is subtracted to account for intermediate costs.
- **Non-marketed.** This category covers the fish and aquatic products that are harvested for household use. The value added is imputed from information obtained in a household income and expenditure survey (HIES). In the years following a HIES the estimated GDP contributions have been derived by extrapolation, based on population, CPI and disaster index. As with the locally marketed fish, 20% is deducted from the gross output to account for intermediate costs.

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

The general methodology appears sound, but the quality of the estimate is, to a large extent, dependent on the accuracy of the HIES and of the survey of “some private businesses”. In general, the accuracy of the factors used to adjust for the cost of intermediate inputs could be improved with some technical input from the fishing sector. The figures used for market fishing (20%) and export (35%) appear low, while the non-market factor (20%) appears high.

Alternative Estimate of Fishing Contribution to GDP

Table 17-5, below, represents an alternative to the official method of estimating fishing contribution to GDP in Tonga. 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 17.1, above, (summarised in Table 17-2), 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 the use of specialised studies (Appendix 3).

It is not intended that the approach in Table 17-5 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 17-5: Fishing Contribution to GDP in 2014 Using an Alternative Approach

Harvest Sector	Gross Value of Production (\$T, from Table 17-2)	VAR	Value Added (\$T)
Coastal Commercial	33,600,000	0.60	20,160,000
Coastal Subsistence	18,700,000	0.75	14,025,000
Offshore Locally based	7,770,000	0.20	1,554,000
Freshwater	6,000	0.95	5,700
Aquaculture	28,000	0.50	14,000
Total (\$T)	60,104,000	--	35,758,700

Source: Table 17-2, and consultant's estimate

The total value added from fishing in Table 17-5 (T\$35,758,700) for calendar year 2014 is almost double the official estimate of T\$18,200,000 for the fiscal year 2013/2014. In the official calculations the non-marketed component is responsible for 26% of the fishing contribution, while in the alternative approach it is responsible for 40%, which is consistent with the idea expressed above, that the 2009 HIES gives low estimates of fishing contribution for non-marketed fish. The value added ratio for marketed fish in the official approach also contributes to the low estimated fishing contribution for non-marketed fish.

17.3 Exports of Fishery Production

The statistics relating to the export of fishery products were extracted from the International Merchandise Trade Statistics (Statistics Department 2015), and are presented in Table 17-6.

Table 17-6: Value of Fishery Product Exports (T\$)

	2013	2014
Fish	4,686,328	6,164,098
<i>of which:</i> Yellowfin tuna (fresh or chilled)	2,292,329	2,652,756
Bigeye tuna (fresh or chilled)	37,820	172,082
Other fish fresh or chilled	1,280,848	2,625,803
Frozen fish	1,042,114	544,061
All other fish	33,217	169,395
Crustaceans and molluscs and other aquatic invertebrates; whether in shell or not; fit for human consumption	1,453,391	5,737,565
Coral and similar materials; unworked	322,642	453,930
Seaweeds and other algae	379,362	127,526
Total value of fishery product exports	6,841,723	12,483,119
Total Domestic Exports	21,829,059	28,229,759
Fishery product exports as a % of total domestic exports	31.3%	44.2%

Source: Statistics Department (2015)

Much of the large increase between the years 2013 and 2014 in the table was due to the increased value of the category “Crustaceans and molluscs and other aquatic invertebrates”. Unpublished data from the Fisheries Division indicates that the exports of beche-de-mer (a very high-value product) increased from 56 mt in 2013 to 143 mt in 2014, and this is likely to be responsible for much of the increase.

The report of the MacBio study (Salcone et al. 2015) commented on the changes to fisheries exports in recent years:

Apart from a sudden increase in 2012 from a change in policy to allow licensing of foreign fishing vessels, exports of fishery products (including aquarium trade) has remained between T\$ 4.5 million and T\$ 7 million since 2006 (US\$ 2.5–4 million). The major exports by value shift substantially among fishery sectors from year to year. In 2010, 66% of fishery export value was from bêche-de-mer, followed by the aquarium trade (18%) and snapper exports (10%); tuna exports were just 3% of total fisheries exports in 2010. In 2011 tuna exports increased to 13%, then to 52% of fisheries exports in 2012. In 2012 shark meat exports increased to 24.5%; and bêche-de-mer fell to just 6.5% (T\$ 545,000) of the total value of fisheries exports. In 2013 tuna exports fell to 38% of fisheries exports, but shark meat exports remained high at over T\$ 1.4m (26%). The value of shark fin exports averaged about T\$ 98,000/yr (1,660 kg) between 2006 and 2013, but shark fin exports have fallen by about 70% since 2006 (4,030 kg).

17.4 Government Revenue from Fisheries

Access Fees for Foreign Fishing

Tonga receives payments for two types of foreign fishing in its zone:

- **Purse seine fishing:** Under the terms of the United States (US) multi-lateral tuna treaty, Tonga and other Pacific Island countries receive payments from the US government and the US tuna industry for fishing access by US purse seine vessels. Some Pacific Island countries consider that all payments under the US treaty are for fishing access, while others treat some components as aid. Actual fishing by the US purse seiners has not occurred in Tonga for many years. According to unpublished data from the US government and the Forum Fisheries ncy, in 2014 Tonga received US\$555,815 (T\$1,033,816) as a treaty payment.

- **Longline fishing:** The Tongan submission to the Scientific Committee of the Western and Central Pacific Fisheries Commission (Fisheries Division 2015) states: “In 2014, a total of 19 foreign flagged longline vessels had valid license to fish in Tonga EEZ.” The “Revenue Report” (unpublished data, Fisheries Division) shows that, in 2014, T\$134,000 was paid for foreign fishing vessel licences.

The above indicates that, in 2014, Tonga received T\$1,167,816 as access fees for foreign fishing.

The total government revenue in fiscal year 2013/2014 was T\$301.5 million (Ministry of Finance and National Planning 2015). The 2014 access fees, of T\$1,167,816, therefore equate to about 0.4% of all government revenue for the 2013/2014 fiscal year.

Government Revenue from Fisheries

The “Revenue Report” (unpublished data, Fisheries Division) shows the government revenue generated in 2014 by the Fisheries Division. This is summarised in Table 17-7.

Table 17-7: Other Government Revenue from the Fisheries Sector

Item	Value (T\$)
Consumption tax collected on sales by the Fisheries Division	68,229
Fish bond	1,700
Sales of produce	580
Domestic licenses (aquarium, shark fin, seaweed, fish fence, etc.)	235,290
Fees (admin, export taxes, sales of illegal beche-de-mer, etc.)	198,347
Other sales	44,240
Total	548,386

Source: Fisheries Division (unpublished data)

17.5 Fisheries-Related Employment

TSD (2004) gives the results of a 2003 survey of employment in the country. In 2003 there were a total of 34,561 people employed⁴ in Tonga, of which 1,050 were employed in the category of “fishing”. fisheries-related employment therefore represented 3% of employment in the country during that period. Of those employed in fishing, 180 (17%) were female.

⁴ Employment in an industry is defined by the study as working at least one hour during the week in the industry.

Tonga Fisheries Project (2005) provided the results of the Tongan Seafood Socio Economic Survey. The survey estimated the number of people engaged in fishing activities: Tongatapu, 6470; Ha'apai, 2053; and Vava'u, 4375. The survey indicated the percentage of self-employed that are fishers: Tongatapu, 5%; Ha'apai, 18%; and Vava'u, 7%. The survey also found that, of the households surveyed, about 64% of Tongatapu households fished for their own supply of seafood and gifts for others. The corresponding figures for Vava'u and Ha'apai were 80% and 82%, respectively.

The Tonga 2009 HIES (Statistics Department 2010) indicates the percentage of "subsistence income" from "fish and seafood", for Vava'u (3.3% of all subsistence income is from fish and seafood), urban Tongatapu (22.7%), rural Tongatapu (14.3%), Ha'apai (4.1%), 'Eua (11.4%), and Ongo Niua (3.3%).

The 2011 census (Statistics Department 2012) provides a considerable amount of information on fisheries-related employment. Table 17-8 shows the main type of work during the week prior to the census for the 64,597 people in Tonga aged 15 years and older. As expected, involvement with fisheries work is most prevalent on small islands and least prevalent in urban areas.

The 2011 census also provides data on involvement with fisheries work by age category. Table 17-8 shows the percentage of people by age who declared their main work type during the previous week as "fishing mainly for sale" or "fishing for own consumption".

Table 17-8: Involvement with Fishing by Geographic Area (15 years +)

	Main type of work during the last week	Fishing mainly for sale	Fishing for own consumption	Fishing as a % of population (15 years +)
Total	64,597	859	437	2,0%
Tongatapu	47,475	552	202	1,6%
Vava'u	9,117	136	87	2,4%
Ha'apai	4,121	141	123	6,4%
'Eua	3,042	20	7	0,9%
Ongo Niua	842	10	18	3,3%
Urban	15,812	108	34	0,9%
Rural	48,785	751	403	2,4%
Greater Nuku'alofa	23,229	259	84	1,5%

Source: Statistics Department (2012)

Table 17-9: Involvement with Fishing by Age Class (15 years +)

All ages	15–19	20–24	25–29	30–34	35–39	40–44	45–49
2.0%	0.8%	1.3%	1.9%	2.6%	2.9%	3.4%	3.4%
50–54	55–59	60–64	65–69	70–74	75+	n/s	
2.8%	2.4%	1.6%	1.4%	0.6%	0.3%	0.0%	

Source: Statistics Department (2012)

A study on the linkages between ecosystems, households, businesses and livelihoods within the Vava'u Archipelago (Salcone 2015, p. 24) contains information on involvement with fisheries:

Households were asked to describe their fishing activities if they had fished at least once per month during the past year. In total, 45 households (31%) responded that they went fishing at least once per month last year, including reef fishing deep-water fishing or near-shore gleaning. Only 35 households responded that they go reef fishing at least once a month (23%), 29 reported gleaning for invertebrates at least once per month (20%), and only 5 households reported going deep-water fishing at least once per month (3.5%). These numbers were lower than expected given that most households interviewed live within a short walk to the sea. Most households fish primarily for their own consumption or to share with family and community members. Only 13 households (29% of fishing households) reported selling at least some of their catch. Many fishing households donated part of their catch to churches or other households. Households who recorded earning income from reef fishing or gleaning earned on average T\$900/month from reef fish (median T\$600/mo) and T\$430/month from invertebrates (median T\$150/mo). Average total income per household from fishing was T\$1,192/mo (approx. T\$14,000/yr). However, the range in income per month was so great that averages may not be representative of household behavior. The median income per month from all types of fishing was T\$600/mo or T\$7,200/yr.

The SPC ProcFish programme surveyed four sites in Tonga (Friedman et al. 2009). Table 17-10 is an extract from the report of the survey, showing the importance of both reef fisheries and the sale of fish. The sites were chosen to be representative of sites having active reef fisheries rather than to be representative of all Tongan fishing activity.

Table 17-10: Involvement with Fisheries at the ProcFish Sites

Site	% households involved in reef fisheries	% households with fisheries as most important source of income
Ha'atafu	90.5	28.6
Manuka	84.2	52.6
Koulo	74.1	14.8
Lofanga	85.0	70.0
Average across the 4 sites	82.8	39.1

Source: Statistics Department (2012)

Kronen (2002) provides information on gender in fishing activities from case studies from Ha'apai and Vava'u Islands. It is indicated that there are three substantial differences between women's and men's fishing activities: 1) women tend to prefer daytime fishing; 2) women focus on shallow waters close to shore; and 3) women mainly fish without using canoes or motorised boats.

The Forum Fisheries Agency has a programme– Economic Indicators Project – that collects data on tuna-related employment in standardised form. FFA (2015) contains information on the employment of people from Tonga in the tuna industry (Table 17-11). Forty five Tongans were employed in the tuna industry in 2014. Across the Pacific in 2014 17,663 people were employed as crew on tuna vessels or in tuna processing and ancillary work (FFA 2015). The tuna-related employment in Tonga therefore represents 0.26% of the regional tuna-related employment.

Table 17-11: Tuna-Related Employment in Tonga (number of people employed)

	2009	2010	2011	2012	2013	2014
Processing and ancillary	20	14	17	6	15	12
Local crew	30	17	9	6	7	33
Total	50	31	26	12	22	45

Source: FFA (2015)

17.6 Levels of Fishery Resource Consumption

The 1998 FAO/Australian Agency for International Development (AusAID) Fisheries Sector Review (Gillett et al. 1998) stated:

It is difficult to make an accurate assessment of the present level of fish intake in Tonga. Although there was a national nutrition survey in 1986, there have been no national food consumption surveys from which average fish consumption could be derived. The figures published for per capita consumption of fish range from a low of 14.0 kg/year to a high of 102.0 kg/year (implying a production of 10,000 mt). Assuming that all the production from inshore fisheries is eaten domestically, and that the best estimate of this in 1995 was 2,362 mt,⁵ then this would provide a supply of 24.2 kg/year for the 1996 population of 97,500. Integrating the 575 mt of imported canned fish gives an overall availability of 30.0 kg/year.

The 2006 annual report of the Fisheries Department (Fisheries Department 2007) reports the results of an unpublished survey:

A seafood socio-economic survey was carried out in 2004-2005 at Tongatapu, Vava'u and Ha'apai and a total of 6,423 households were involved. The outcome of the survey revealed that the number of seafood meals for households at Tongatapu averaged 2.6 per week, while the average seafood meals per week for Vava'u and Ha'apai were 2.9 and 3.2, respectively.

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 the whole of Tonga the annual per capita fish consumption (whole weight equivalent) was 20.3 kg.⁶ Fresh fish made up 80% of this amount.

The SPC ProcFish programme carried out survey work at four sites in Tonga (Friedman et al. 2009). That work included estimations of per capita fish consumption. The results (Table 17-12) indicate fish consumption rates at four sites.

⁵ This is the estimate of Dalzell et al. (1996) for the early 1990s, which Gillett and Lightfoot (2001) considered under-estimated the true numbers.

⁶ Section 17-1 above, contains some reservations about the accuracy of the Tonga HIES for estimating fisheries production.

Table 17-12: Fishery Product Consumption at ProcFish Site (kg/person/year)

Village	Fresh fish consumption	Invertebrate consumption	Canned fish consumption
Ha'atafu	91.77	20.99	16.99
Manuka	77.64	2.63	9.99
Koulo	46.60	6.68	18.59
Lofanga	65.25	16.83	21.24
Average across the 4 sites	68.57	11.58	16.99

Source: Friedman et al. (2009)

Salcone et al. (2015) examine the FAO Food Balance Sheets spanning the years 2005 to 2011. It is stated that fish consumption results, based on production, imports and exports, vary substantially from year to year. Fish represented 10.2% of protein in 2005, 13.5% in 2007, 14.3% in 2009, 9.9% in 2010, and 11.5% in 2011. In the period 2007–2011 there was between 30 kg and 35 kg of seafood per capita available in Tonga per annum.

Kelleher (2015) presents information on canned fish consumption. In the period 2008–2012 approximately 1,400 mt of canned fish was imported annually. The average price was US\$1.80 per kg, and the imports were valued at approximately US\$2.5 million per year.

The consumption by Tongans of fish caught by offshore fishing is substantial. It is stated above that the 2014 tuna catch of 243 mt by Tonga-based offshore fishing vessels was accompanied by 228 mt of bycatch. The proportion of fish catch that was not exported (i.e., it was consumed locally) is not known with certainty, but if it assumed (based on general statistics in the fishing industry) that 20% of the tuna catch and half of the bycatch was not exported, this equates to 1.6 kg/person/year for all of Tonga. This consumption rate does not consider consumption by tourists and other visitors.

17.7 Exchange Rates

The average yearly exchange rates (Tonga Pa'anga (T\$) to US dollar) used in this book are as follows.

2006	2007	2008	2009	2010	2011	2012	2013	2014
2.01	2.02	1.85	1.90	1.81	1.73	1.74	1.85	1.86