FISHERY AND AQUACULTURE COUNTRY PROFILE	Food and Agriculture Organization of the United Nations	FID/CP/TON
PROFIL DE LA PÊCHE ET DE L'AQUACULTURE PAR PAYS	Organisation des Nations Unies pour l'alimentation et l'agriculture	
RESUMEN INFORMATIVO SOBRE LA PESCA Y LA ACUICULTURA POR PAÍSES	Organización de las Naciones Unidas para la Agricultura y la Alimentación	May 2010

NATIONAL FISHERY SECTOR OVERVIEW

TONGA

1. GENERAL GEOGRAPHIC AND ECONOMIC DATA

Area:	747 km²
Water area:	700 000 km²
Shelf area:	[no continental shelf]
Length of continental coastline:	419 km (length of the coast of islands)
Population (2007)*:	103 000
GDP at purchaser's value (2005/06 financial year)	243 993 000 USD[1]
GDP per head (2006):	2 397 USD**
Agricultural GDP (2006):	51 872 000 USD[2]
Fisheries GDP (2006):	10.0 million USD[3] **

*UN Population Division
**Tonga National account statistics: www.spc.int/prism/country/to/stats

2. FISHERIES DATA

2007	Production	Imports	Exports	Total Supply	Per Caput Supply
	tonnes liveweight				kg/year
Fish for direct human consumption[4]	2 549	2 380	1 321	3 608	35.0
Fish for animal feed and other purposes	0	---	0	---	

Estimated Employment (2003):	
(i) Primary sector (including aquaculture):	1 050[5]
(ii) Secondary sector:	Unavailable
Gross value of fisheries output (2007):	20.6 million USD[6]
Trade (2007):	
Value of fisheries imports:	USD 2 390 000

[1] Tonga National account statistics: www.spc.int/prism/country/to/stats
[2] Tonga National account statistics: www.spc.int/prism/country/to/stats
[3] This is the official fishing contribution to GDP – which includes (a) local market component, (b) non-market component, and (c) export component; A recalculation shows the total fishing contribution to be USDD 12.0 million: Gillett (2009). The Contribution of Fisheries to the Economies of Pacific Island Countries and Territories. Pacific Studies Series, Asian Development Bank, Manila
[4] Data from FAO food balance sheet of fish and fishery products.
[5] The results of a 2003 survey of employment in the country show that there were a total of 34,561 people employed in Tonga, of which 1,050 were employed in the category of "fishing". Employment in an industry is defined as working at least one hour during the week in the industry. Source: TSD (2004). Report on the Tonga Labour Force Survey 2003. Tonga Statistics Department, Nuku'alofa.
[6] Tonga National account statistics: www.spc.int/prism/country/to/stats

Value of fisheries exports:	USD 2.8 million

3. FISHERY SECTOR STRUCTURE

3.1 Overall fishery sector

The geography of Tonga exerts a large influence on fishing in the country. Tonga is made up of some 150 islands (of which about 36 are inhabited), as well as many smaller islets and reefs. The islands, whose collective land area is about 747 sq. km., are distributed in three main groups - Tongatapu (location of the capital and administrative centre, Nuku'alofa) and neighbouring islands in the south, the Ha'apai group located centrally, and the Vava'u group to the north. Other islands extend the archipelago further north and south beyond the main groups.

Up to the early 1960s domestic demand for fish was almost wholly met through catches from the country's reefs and lagoons. Subsequently, however, increases in population and fishing effort and the growth of the cash economy have led to overfishing in many inshore areas. Some traditionally important fish, especially mullet, have been reduced to a small fraction of their earlier abundance, and inshore invertebrates such as bêche-de-mer, lobsters and giant clams have undergone severe declines, some quite recently. These problems are found throughout Tonga, but are most acute close to population centres or in easily accessible fishing areas.

Insufficient production from coastal fisheries led to several strategies to increase fish production. These mostly started in the 1970s and included outer-islands fish collection schemes, promotion of offshore tuna fishing and deep-slope demersal fish fishing, and attempts to develop aquaculture.

With respect to the current situation, Tonga's fisheries can be placed into six categories. These categories and the associated production in 2007 are estimated as:

	Coastal Commercial	Coastal Subsistence	Offshore Locally-Based	Offshore Foreign-Based[7]	Freshwater	Aquaculture	
						Tonnes	Pieces[8]
Volume of Production (metric tonnes or pieces)	3 700	2 800	1 119	0	1	---	12 334
Value of production (USD)	11 287 129	6 182 178	3 081 498	0	1 980	18 317	

Source: Gillett (2009)

The main trends and important issues in the fisheries sector

The main trends in the sector include:

- Increasing exploitation of the coastal resources, especially those close to urban markets.
- Growing recognition that (a) for effective coastal fisheries resource management to occur, coastal communities need to be more involved in the management process; and (b) for this to occur, some form of preferential access to adjacent resources by those communities is required.
- Decreasing number of locally-based longline vessels and associated employment in the present decade.

[7] This is the catch taken by foreign fleet within the Tonga EEZ. In FAO statistics of capture fisheries production, this catch is accounted under the catch of the nation(s) under which the vessel(s) is (are) flagged.

[8] Pearls and giant clams are commonly measured in pieces, rather than kg.

- A gradual increase in the present decade of stakeholder input into the government fisheries agency.
- Greater use of fisheries management plans to manage the major fisheries in the country.
- A continuing dominance of Tonga as the leading exporter of deep-slope demersal fish in the Pacific Islands

Some of the major issues in the fisheries sector are:

- In recent years there has been a perception on the part of the fishing industry of high rates of taxation and high charges for government services
- A large investment in aquaculture development activities has yielded disappointing results.
- The regional/global move to ecosystem-approach to fisheries management, however desirable, is clashing with the realities of fisheries management in Tonga.
- Although there is a large desire on the part of the government for development of a domestic tuna industry, there are considerable difficulties of operating such an industry from a high cost location such as Tonga.
- It is important to attain an appropriate balance between regional/international aspects of fisheries and domestic aspects of fisheries.

3.2 Marine sub-sector

The marine fisheries have two very distinct components, offshore and coastal:

- Offshore fisheries are undertaken on an industrial scale by locally-based longline vessels.
- Coastal fishing is primarily carried out for subsistence purposes and for sales in local markets. In addition, there are some coastal fisheries that are export oriented: bêche-de-mer, aquarium fish, and deepwater demersal fish.

3.2.1 Marine Catch profile

The Tongan longline fleet has reported the following catch of tuna and tuna like species (albacore, bigeye, yellowfin, blue marlin, black marlin, striped marlin and swordfish) to the Western and Central Pacific Tuna Commission (WCPFC) are:

Catches by the Tonga Longline Fleet (tuna and tuna-like species)

	2004	2005	2006	2007	2008	2009
Total catch volume (tonnes)	433	677	829	941	649	312

Estimates of the volumes and values of the catches of the four main commercial species of tuna in Tonga have been made also by the Forum Fisheries Agency[9], using data sourced from the Oceanic Fisheries Program of the Secretariat of the Pacific Community. By adding in volumes and values of bycatch, estimates of total catches can be made.

Catches by the Tonga-Based Longline Fleet (tuna plus bycatch)

	2002	2003	2004	2005	2006	2007
Total catch volume (tonnes)	2 174	1 262	504	818	988	1 119
Total catch value (USD)	4 241 452	2 884 456	1 473 014	2 617 727	2 938 100	3 364 662

Estimates of catches from the coastal fisheries vary widely. Indications are that in the first part of the new millennium annual catches were of the order of 3000 tonnes. In 2008 the Asian Development Bank examined a large number of studies on coastal fishing in Tonga, and

[9] FFA (2008). The Value of WCPFC Tuna Fisheries. Unpublished report, Forum Fisheries Agency, Honiara.

made catch estimates by extrapolating earlier estimates on the basis of population and fish prices changes as per the Tonga Statistics Department (2007)[10]. Accordingly, the study determined that a crude estimate of the recent annual production from Tonga's coastal commercial fisheries is 3 700 tonnes (of which about 700 tonnes was exported), worth about USD11.3 million to the producer (of which about USD2.4 million were for products that were exported). Similarly, the study estimated that the production from coastal subsistence fisheries in Tonga in 2007 was about 2 800 tonnes, worth USD 6.2 million.

3.2.2 Marine landing sites

The offshore fishing vessels offload their catch at Nuku'alofa, the main urban area. In the past some of the larger longliners delivered their catch directly to the cannery in Pago Pago, American Samoa.

Deep-slope bottom fishing vessels deliver their catch to Nuku'alofa, and to a smaller degree, to Neiafu in Vava'u.

The catch from small-scale commercial fishing is delivered to several locations on Tongatapu (especially in the Nuku'alofa urban area), to Neiafu in Vava'u, and to Lifuka in Ha'apai. Much of the landings at the latter location are for onward shipment to markets in the Nuku'alofa urban area.

Subsistence fishery landings occur at coastal villages throughout the country, roughly in proportion to the distribution of the population.

3.2.3. Marine fishing production means

All offshore tuna catches in the Tonga EEZ are made by locally-based longliners. These vessels range in size from 18 to 39 metres in length. The WCPFC yearbook of 2009 gave information on the recent evolution of this fleet: 35 longliners in 2002, 22 in 2004, 14 in 2006, 9 in 2008 and 7 in 2009. Fishing trips are usually 5 to 10 days in length for the smaller longliners which use ice to preserve the catch. The larger vessels can stay out for nearly a month and freeze the catch.

Tonga is the leading producer of deep-slope demersal fish in the Pacific Islands region. This fishery has its origins in the exploratory fishing carried out in the 1970s by the FAO and the South Pacific Commission, which was followed up by a comprehensive fisheries development programme by the government and the United Nations Development Program. A report done for the Worldwide Fund for Nature[11] contains a description of current deep-slope bottom fishing in Tonga (Box).

Deep-slope bottom fishing in Tonga

A typical fishing trip starts when the fishing crew loads ice, food, and fuel onto the vessel – which range from 9 to 15 metres. They depart Nuku'alofa and travel perhaps 75 nautical miles or more to a spot selected by the captain. Although the ocean surrounding the islands of Tonga is several thousands of metres deep, there are over 100 seamounts, or underwater mountains which rise up relatively close to the surface. These seamounts are where the snappers are found and are the location that fishing captains seek as their fishing spots. A snapper boat anchors on a seamount and the crew use four large hand-operated fishing reels to lower their lines to the bottom. To each line are attached 12 to 30 hooks, baited with either saury, skipjack, or squid. The actual fishing is hard work. At a depth of 300 metres it takes a crewman about 8 minutes to crank up the hooks. During a good fishing day four hours could be spent grinding on the large reels. In nice weather, from four to five days are spent on the fishing grounds, followed by a day of motoring back to port. Most vessels arrive in Nuku'alofa late Friday night

[10] TSD (2007). Key Statistics. Tonga Statistics Department, Nuku'alofa.
[11] Gillett, R. (2008). Coastal Fisheries in the Pacific Islands Region: Candidates for Marine Stewardship Council Certification. Worldwide Fund for Nature, Suva.

In September 2009 there were 13 active deepwater bottom fishing vessels (three of which were based in Vava'u). This does not include three vessels that have recently departed the deepwater bottom fishery and commenced fishing for bêche-de-mer. The 13 vessel fleet does include 3 vessels that supply only the local market. The original deepwater bottom fishing fleet in the 1980s ranged in size from 21 to 32 feet[12]. The average vessel length increased from 8.5 meters in 1994 to 10.6 meters in 2002. The current management plan for the fishery states "The total length of vessels licensed for snapper and grouper fisheries must not be more than 15m".

Other types of coastal commercial fishing use a wide variety of gears. A recent survey[13] of fish arriving in Tongatapu from Vava'u and Ha'apai showed that almost half of the fish that arrived was caught by diving, 34% from handlining, and around 10% from droplining. The rest was caught using various other methods, including netting and gleaning. These results could be considered as indicative of the types of small-scale commercial fishing in the country.

Spear fishing is very important in Tonga. An FAO survey[14] in 2006 provides some information on this fishery. The use of underwater torches for night spear fishing appears to have originated in the 1960s. Halapua (1982)[15] indicates that spear fishing in Tongatapu (both day and night) was well-established in the 1970s with 57 full-time divers. He also states that most Tongatapu divers at that time had Ha'apai origins. A bêche-de-mer boom in Tonga (roughly mid-1980s to mid-1990s) and its associated diving with hookah[16] and scuba apparently increased the skills and interest of individuals in this gear, while a bêche-de-mer ban in the mid-1990s created a pool of unemployed divers. There are several types of spear fishing in Tonga: predominantly subsistence, small-scale commercial, recreational, and operations that involve many divers on a large vessel. The gear used for spear fishing in the country is not very sophisticated. Fins, masks, and snorkel (often very worn) appear to be used by all divers. Sling spears are far more common than spear guns. Wetsuits are not often used. The Tongatapu spear fishing vessels (mostly 6 to 8 metres in length) are all outboard-powered and most are made of wood and have a small cabin.

The subsistence fishing techniques are similar to those for small-scale commercial fishing: diving, handlining, and netting. Gleaning by women is especially common. A study of women's fishing activities in Tonga[17] showed that the major activities of Tongan women in harvesting marine resources have traditionally been reef gleaning for shellfish, holothurians and echinoderms.

3.2.4 Main resources

The WCPFC yearbook showed that albacore dominates, accounting for 34 to 56% of the total tuna and tuna-like species longline catch, followed by yellowfin at 24 to 45% and bigeye at 8 to 27%. An Asian Development Bank report[18], based on its review of the catch composition of the locally based longline fleet in the period 2003 to 2007. indicated that the amount of bycatch is about 26 to 32% of total catch. Dolphinfish and moonfish accounted for more than 50% of this bycatch.

In the deepwater bottom fishery, the major resources are numerous species of snappers, groupers, and other demersal fish. Bell (1994)[19] states that the most important deep-slope species landed in Tonga include *Aphareus rutilans* (rusty jobfish - *palu polosi*), *Aprion virescens* (green jobfish - *utu*), Carangidae (trevallies and jacks - *lupo*), *Etelis carbunculus*

[12] Wilson, M. (2007). The Tongan DW Line Fishery 2007 An Assessment of the Need for Fisheries Management. Tonga Fisheries Project.
[13] Lautaha, T. and Cohen, P. (2004). Sampling of Coolers Arriving on Ferries. Ministry of Fisheries, Tonga, unpublished manuscript.
[14] Gillett, R. and W. Moy (2006). Spearfishing in the Pacific Islands: Current Status and Management Issues. FAO FishCode Review No.19, ISSN: 1728-4392, Food and Agriculture Organization of the United Nations, 72 pages.
[15] Halapua, S. (1982), Fishermen of Tonga – their means of survival. Institute of Pacific Studies and the Institute of Marine Resources. University of the South Pacific, Suva.
[16] Hookah - a colloquial, but widely used, term for a surface supply diving apparatus usually involving the supply of breathing air from a small compressor unit via a free floating air supply hose to a mouth held demand breathing gas supply device.
[17] Walton, H. (1998). Supporting women in fisheries. Tonga Fisheries Sector Review, Volume 2. Food and Agriculture Organization of the United Nations (Rome) and Australian Agency for International Development (Canberra).
[18] Halafihi, T. and U. Fa'anunu (2008). Tonga Tuna Fishery Annual Report to SC4 Papua New Guinea, 22nd August 2008. Working Paper 29, Western and Central Pacific Fisheries Commission, Scientific Committee, Fourth Regular Session, Port Moresby, Papua New Guinea.
[19] Bell, L. (1994). Fishery Resource Profiles – Kingdom of Tonga. Report 94/5, Forum Fisheries Agency, Honiara.

(short-tailed red snapper - *palu malau*), *E. coruscans* (longtail snapper - *palu tavake*), *Epinephelus morrhua* (comet grouper - *ngatala*), *E. septemfasciatus* (convict grouper - *mohuafi*), *Pristipomoides filamentosus* (crimson jobfish - *palu hina*), *P. flavipinnis* (golden eye jobfish - *palu sio'ata*), *P. argyrogrammicus* (Ornate jobfish), *Lethrinus chrysostomus* (sweetlip emperor - *manga*), and *Gymnocranius radiosus.*

With respect to coastal commercial fishing, the Ministry of Fisheries' Inshore Fisheries Statistics programme lists the major reef-fish species landed at the domestic markets (Bell 1994). These include: Unicorn and Surgeon fishes (Acanthuridae), Squirrelfishes (Holocentridae), Wrasses (Labridae), Emperors and Sea-breams (Lethrinidae), Seaperches (Lutjanidae), Goatfishes (Mullidae), Sweetlips (Plectorhynchidae), Parrotfishes (Scaridae), Rabbitfishes (Siganidae), Half-peak parrotfishes (Sparisomidae), Sea-pikes (Sphyraenidae), Drummerfishes (Kyphosidae), Rock-cods (Epinephelidae), Silver-biddy (Gerridae), Trigerfishes (Balistidae), Bullseyes (Priacanthidae), and Majors (Abudefdufidae).

Quantitative information on the species composition in the Tongatapu spearfishing catch is given in Vaikona et al. (1997)[20]:

The Five Major Species Caught by Diving

	Tongan name	**English name** *Scientific name*	**Percentage in catch Category**
Night diving	Hohomo	Parrotfish *Scarus spp.*	19%
	'Ume	Unicornfish *Naso unicornis*	17%
	Ma'ava	Rabbitfish *Siganus argenteus*	17%
	Olomea	Parrotfish *Scarus spp.*	10%
	Pone	Surgeonfish *Acanthurus spp.*	7%
	Others		30%
			100%
Day diving	Pone	Surgeonfish *Acanthurus spp*.	38%
	Hohomo	Parrotfish *Scarus spp*	13%
	Feke	Octopus	9%
	Ngatala	Grouper *Epinephelus spp.*	8%
	Ta'a	Squirrelfish *Ostichthys spp*.	5%
	Others		26%
			100%

In a World Bank study, residents of six coastal communities in Tonga were asked to name the three subsistence fishery resources of most importance to them. Seven resources were most often cited: finfish, octopus, lobster, bêche-de-mer, turbo, giant clams, seaweed, and Anadara.

3.2.5 Management applied to main marine fisheries

[20] Vaikona, L., V. Kava, and U. Fa'anunu (1997). Inshore Fisheries Statistics Annual Report 1996. Ministry of Fisheries, Kingdom of Tonga.

Tonga is a member of the Western and Central Pacific Fisheries Commission that was established by the Convention for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean. The Convention entered into force in June 2004.

The management of the offshore fishery, deep-slope bottom fishery, aquarium fish, and bêche-de-mer is undertaken through the framework of formal management plans. The management of other coastal fisheries is less formalized; the management framework consists of the Fisheries Act, various regulations, and the policies of the ministry responsible for fisheries.

A major feature of resource management in Tonga is the open access nature of Tonga's inshore fisheries. Basically, all Tongans can fish anytime/anywhere, with few restrictions on participation. Petelo et al. (1995)[21] summarizes the situation (Box).

Open Access in Tonga's Inshore Fisheries

Tonga's sea areas were defined by Royal Proclamation in 1887 to be all islands, rocks, reefs, foreshores and water lying between 15 and 23.5 degrees south latitude and between 173 and 177 degrees west longitude. In other words, Tonga was defined as being all that inside a boxed area and that all geographic features are owned by the King. The Land Act of 1927 further reinforced this ownership. With respect to fishing, this has resulted in two consequences: (1) all Tongans have equal fishing access to all Tongan waters and (2) any traditional claim of local control or management authority over fishing areas was abolished. Although Tonga is the only Pacific Island country not to have been colonized, it is the only country in the region to have done away entirely with any traditional fisheries management which may have existed. It should be noted that in the Tongan context this is not incongruous: the King is the maker of traditions in Tonga.

The open access nature of fisheries in Tonga is in some respects compatible with the sharing nature of Tongan society. Nobody would refuse to give food to a hungry person and to discourage somebody from fishing in an area regardless of the purpose or how close to a village was. This system may have worked reasonably well in the era of subsistence fisheries, but it has fairly recently collided with commercial realities and the carrying capacity of inshore resources. A recent survey team visited 11 villages in Ha'apai to discuss development issues (land, marine, health, environment, etc.). In many of the villages the priority concern was the fact that Tongans from anywhere, especially commercial operators from Tongatapu, could harvest the food resources adjacent to villages thereby affecting the food security situation. One frequent comment from villagers in Ha'apai is that, even if a community conserves and manages its adjacent marine resources, it may be a useless exercise as outsiders can, and have, moved in to over-harvest.

Source: Petelo et al. (1995)[22]

Management Objectives

The current Tonga National Tuna Management and Development Plan was enacted in 2002 by the Minister responsible for fisheries. The stated objectives of the conservation, management and development of the tuna fishery are to: (a) ensure that the utilisation of Tonga's national tuna resource is compatible with the sustainable harvesting of the tuna stocks throughout their range; (b) maximise economic benefits to Tonga from the utilisation of its tuna resources, including harvesting and processing; and (c) contribute to the food security of Tongan subjects and, through the sustainable utilisation of the tuna stocks.

[21] Petelo, A, S. Matoto, and R. Gillett (1995). The Case for Community-Based Fisheries Management in Tonga. Background Paper 61, Workshop on the Management of Pacific Island Inshore Fisheries, South Pacific Commission, Noumea.

[22] Petelo, A, S. Matoto, and R. Gillett (1995). The Case for Community-Based Fisheries Management in Tonga. Background Paper 61, Workshop on the Management of Pacific Island Inshore Fisheries, South Pacific Commission, Noumea.

The current Snapper and Grouper Fisheries Management Plan was endorsed by cabinet in 2007. The Plan gives the following objectives:

- Objective 1: To ensure that utilization of the deep bottom fish resources are for long-term conservation and sustainable benefit;
- Objective 2: To maximize economic welfare to Tonga from utilization of its deep bottom fish resources including harvesting, processing and exporting;
- Objective 3: To contribute to the food security and livelihoods of Tongan subjects through sustainable utilization and employment.

Other management objectives are given in the bêche-de-mer management plan and the aquarium fisheries management plan.

The objectives for the management of the other coastal fisheries are not consolidated in a single document. In general, the objectives are required to conform to the Fisheries Management Act 2002. That law requires that measures promote the objective of optimum utilization and to achieve economic growth, human resource development, employment creation and sound ecological balance. In practice, the purposes of many management measures for coastal fisheries are to prevent resource collapse, deter destructive fishing, and to mitigate threats to the flow of food from coastal fisheries.

Management measures and institutional arrangements

Various management measures are used for the different fishery categories:

- The current tuna management plan establishes a total allowable catch/harvest target per annum for the longline fishery and a limit on the number of vessels participating in the fishery.
- The Snapper and Grouper Fisheries Management Plan places maximum limit of 20 hooks per line, a maximum size of 15 meters on vessel length, and a ban on the use of electric reels.

A more diverse array of measures is used in the management of coastal fisheries. These include total bans on certain types of fishing (e.g. use of explosives, poisons), temporary bans (e.g. a 10-year ban on bêche-de-mer fishing), size restrictions for certain species (e.g. lobster), and export restrictions (e.g. controls on giant clam exports). Most management measures are related to fishing input, while output controls have in recent years only been placed on export-oriented fisheries.

The Fisheries Division is responsible for formulating management measures and (after approval by the minister responsible for fisheries) implementing the measures. Until the late 1990s there was little consultation with fishery stakeholders on the need for, and form of, management measures. In the previous decade the concept of consultation with stakeholders has been embedded in legislation and management plans (see box)

Box: Institutionalization of Stakeholder Input in the Management of the Snapper Fishery[23]

Consistent with the Section 7(4) of the Fisheries Management Act 2002, a Snapper Fishery Management Committee (SFMC) is established under this Plan. The Committee shall be primarily responsible for the implementation and review of the fishery plan or otherwise monitor the performance of the fishery subject of the fishery plan or perform such other duties and responsibilities as are given it under the fishery plan consistent with this Act. The main functions of the SFMC will be to:

- **Advise the Minister and Secretary for Fisheries through the requirements of the FMA 2002 and on the effective management and administration of the Snapper Fisheries;**
- **Provide a forum for discussion of issues and strategies that require the input of all stakeholders, industry, other government ministries and the Ministry;**
- **Implement, monitor and review the management plan;**
- **Provide recommendations and advice to the Head of Ministry of Fisheries**

[23] The deepwater bottomfish fishery is often in Tonga referred to as the "snapper" fishery – despite the fact that fish other than snapper are targeted.

relating to the snapper & grouper fisheries operations on a regular basis for management and operational purposes; and

- **Ensure transparent decision making in regard to the snapper & grouper fishery.**

The SFMC will have representation from all major stakeholders and should include the following representatives:

- **Fisheries Management representative from the Ministry of Fisheries;**
- **Compliance representative from the Ministry of Fisheries;**
- **Representatives from such other government ministries/departments as selected by the Head of the Ministry of Fisheries;**
- **Representatives from the Vava'u snapper & grouper fisheries licence holders;**
- **A representative from the Tongan Fish Exports Association;**
- **Three representatives of the licensed snapper fishers (at present they do not have any association); and**
- **ad hoc advisors and members as determined by the Committee Chair.**

The open access nature of inshore fishing areas in Tonga creates special problems for fisheries management (see box on open access above). The net effect of open access and associated lack of community control is that the conditions do not encourage a long-term relationship with the resource. The first-come-first-served regime now prevailing is an incentive to harvest as much as possible, as fast as possible. A pilot project is underway in which selected communities are given some degree of management control in their inshore fishing areas. In section 13 of the Fisheries Management Act 2002, the Minister may declare any area of the fisheries waters and corresponding subjacent area to be a "Special Management Area" (SMA). Additionally, section 14 of the Act states that the Minister may designate any local community in Tonga to be a coastal community for the purposes of community based fisheries management. These provisions in the Act are the cornerstones of community based initiatives and sustainable development. In 2006 the three pilot communities in Ha'apai were selected for this programme: 'O'ua, Felemea and Ha'afeva. Those communities formulate a management plan and have a legal foundation for implementing the plan. Subsequently, three other communities have applied and been selected to join the programme. There is the intention of expanding the programme to other parts of Tonga.

Institutions

The main institutions involved with fisheries management are the Fisheries Division (formerly, the Ministry of Fisheries) and the Fisheries Advisory Committee. The Fisheries Act 2002 specifies that the Minister shall, in consultation with the Fisheries Advisory Committee, determine the total allowable catch or total allowable level of fishing with respect to any stock of fish subject to the provisions of this Act or as provided in a fisheries management agreement.

In practice, the major fisheries (tuna, deepwater bottomfish, bêche-de-mer, aquarium fish) have management plans that establish committees that are dedicated to the specific fishery. For example, the tuna management plan states "stakeholders are to be represented in the Tuna Management Committee which will advise the Secretary and the Minister on the management of the tuna resources."

Other institutions that are important in the management of fisheries are the Fishing Industry Association of Tonga (represents the larger fishing companies), and the Tonga National Fishing Association (represents mainly the smaller fishing operations). For enforcement of management measures the important institutions are the Tonga Police and the Tonga Defense Services.

3.2.6 Fishermen Communities

The concept of "fishermen communities" has limited applicability to Tonga. Nearly all households in coastal villages are involved in coastal fishing activities. It could therefore be stated that all coastal villages in Tonga are "fishing communities".

3.3 Inland sub-sector

The lack of large freshwater bodies in Tonga results in the freshwater catches being extremely small. Catches of fish in fresh water appear limited to tiny amounts of tilapia in small lakes in the three northern island groups of the country.

3.4 Recreational sub-sector

Although subsistence fishing may have a large social component and be enjoyed by the participants, there is little recreational fishing as a leisure activity for villagers. There are fishing clubs in Tongatapu and Vava'u. Most members of those clubs are expatriate residents of Tonga. Commercial game fishing (mostly open-ocean trolling) is a popular tourist activity, especially in Vava'u where 11 commercial sport fishing vessels are registered.

There is no active management of the recreational sub-sector, with one exception: the Fisheries Act states "No fishing vessel shall be used for reward or hire for sport fishing in the fisheries waters without a commercial sport fishing vessel licence issued by the Secretary".

The Fisheries Division has plans to formulate a management plan for sport fishing activities.

3.5 Aquaculture sub-sector

Aquaculture research has been carried out in Tonga for almost 50 years, mostly by the Fisheries Division, with extensive support from a wide range of foreign aid donors. The research carried out has been mostly biological in nature and has covered a wide range of aquaculture candidate species including finfish (tilapia, mullet, mollies, milkfish), molluscs (edible oysters, pearl oysters, mussels, giant clams, green snail, trochus) and algae (Eucheuma and, recently, angel-hair seaweeds). Little economic development has resulted from this work, although there are some promising avenues.

An FAO report explores some of the reasons for the lack of development of aquaculture in Tonga (Box)

Some Lessons in Aquaculture Development

There appear to be two lessons to be learned from aquaculture development in Tonga:

- **Although basic biological and technical work is an essential beginning to any aquaculture research and development project, economic studies are also needed at an early stage in order to identify and focus resources on the research lines that have a real potential to generate development, and to avoid those most likely to lead into dead ends. Economic work - meaning market studies, examinations of comparable projects elsewhere, and financial modeling of alternative production scenarios - should proceed in parallel with technical and biological work rather than following it, as has often been the case in Tonga. Failure to carry out economic feasibility studies at an early stage may be one of the reasons why non-viable research avenues have not been identified and discontinued at an early stage, and therefore why so much long-term aquaculture research work in Tonga has failed to lead to any economic development.**

Another problem in translating research work into economic development appears to be that even where research may have identified commercial potential there has generally not been a parallel set of extension activities to promote commercial or economic development. At a higher level, there does not appear to be any kind of planning or provision for such extension activities within the aquaculture programmes that have so far taken place. Although research activities may be planned several years in advance, it has been assumed that development will flow on naturally once research has overcome technical problems. In practice, however, the Ministry's aquaculture work has sometimes become locked in the research phase due to the absence of any specific plans or mechanisms for building on research results.

Source: Preston (1998)[24]

[24] Preston, G. (1998). Cost and benefits of aquaculture research and development in Tonga. FAO/AusAID Fisheries Sector Review, Food and Agriculture Organization of the United Nations, Rome.

Recent annual reports of the government fisheries agency and discussion with its staff give information on aquaculture production:

- Fisheries Division (2008)[25] states that in 2007 "aquaculture development in recent years has been relatively slow and limited to stock enhancement largely at community level with little significant commercial production…..At the end of the year about 12,134 clams equivalent of T$33,297 were sold."
- Fisheries Department (2007)[26] states that in 2006 "Aquaculture production for the year was largely carried out by the Ministry of Fisheries. Main projects included enhancement of giant clams, trochus and green snails. Research trials were aimed at reviving and enhancing over-exploited resources."
- Aquaculture staff of the Fisheries Division[27] indicate that mabe pearls are being produced by three or four people in Vava'u. About 200 pearls are produced each year, with an average value of T$20

Aquaculture production in Tonga in 2007 is estimated to be about 12 000 pieces[28], worth about USD 18 000. The fisheries authority only recorded 0.8 tonnes of production of three giant clam species from the entire aquaculture sub-sector for 2008.

A new aquaculture initiative in Tonga may get around some of the past difficulties in aquaculture development in Tonga. A project with funding from the Australian Center for International Agriculture Research is a partnership between the Tongan Fisheries Division, the Secretariat of the Pacific Community, and a commercial aquariumfish company. The project is culturing "live-rock" and corals for the aquarium trade. The unique aspect is that, by having a partner with substantial commercial experience in the aquarium trade, the work will focus on what industry wants – to ensure that the efforts are not wasted[29].

4. POST-HARVEST USE

4.1 Fish utilization

In general offshore fishing is export oriented. The high quality fresh bigeye and yellowfin is typically exported to Japan and the USA. Much of the albacore is sent to canneries in American Samoa, although an increasing amount is sold domestically due to high fish prices. The bycatch from the offshore fisheries is consumed locally.

In the coastal fisheries:

- For deepwater bottom fishing about 2/3 of the catch is exported, with the remainder mostly for restaurants in Tongatapu. All deepwater bottom fish exports currently go to Hawaii.
- The bêche-de-mer is shipped to China
- The aquarium fish and associated coral products are shipped to the USA
- Inshore finfish and invertebrates are largely consumed by the harvesting household, but there is a significant trade between Ha'apai and the markets in Tongatapu, as well as the export of seafood for relatives overseas.

Aquaculture production of giant clams is for the aquarium trade in the USA. The cultured pearls are mainly for the tourists that visit Tonga.

4.2 Fish Markets

Domestic fish markets are found in the urban areas of the country. The Nuku'alofa area has one major fish market, several smaller ones, and significant roadside sales. Some fishing companies distribute fish to the restaurant trade.

[25] Fisheries Division (2008). Annual Report for the Year 2007. Fisheries Division, Ministry of Agriculture & Food, Forests and Fisheries, Nuku'alofa.
[26] Fisheries Department (2007). Annual Report for the Year 2006. Fisheries Department, Ministry of Agriculture & Food, Forests and Fisheries, Nuku'alofa.
[27] P. Ngaluafe, personal communication, September 2008
[28] mostly giant clams and some pearls
[29] FIAT (2009). Fish Tales – a monthly publication of FIAT. Fishing Industry Association of Tonga, Nuku'alofa.

Currently there is only one exporter of deepwater demersal fish and that company ships exclusively to one buyer in Honolulu, Hawaii. For many decades albacore was shipped to the two canneries in American Samoa, but in 2008, one of those canneries ceased operation. Aquarium fish are handled by agents in the USA affiliated with the local Tongan harvestor/exporter. Although it is known that the destination for Tongan bêche-de-mer is China, the marketing arrangements are mostly unknown.

5. FISHERY SECTOR PERFORMANCE

5.1 Economic role of fisheries in the national economy

A recent study by the Asian Development Bank attempted to quantify the fishery-related benefits received by Tonga. The study gave the available information on the contribution of fishing/fisheries to GDP, exports, government revenue, and employment. The results can be summarized as:

- Official estimates show that fishing in 2008/09 was responsible for 4.1 % of the GDP of Tonga.
- Exports of fishery products are about 36 % of all export in 2007.
- Access fees paid by foreign fishing vessels represent 0.2 % of all government revenue.
- Formal jobs directly related to fisheries represent about 3 % of the total number of formal jobs in the country.
- According to Agricultural census in 2001, 33% of household was engaged in fishing at that time.

From the above it can bee seen that fisheries make a relatively important contribution to GDP, exports, and employment.

5.2 Demand

The per capita consumption of fish in Tonga, based on the 2007 FAO Food Balance Sheet, is 35.0 kg. Various other studies have made estimates ranging between 25 and 58 kg. Considering Tonga's population, 35 kg of fish consumption per capita translates into a 2010 demand for 3 627 tonnes of fish.

Factors influencing the future demand for fish are emigration, increase in the price of fish (over-exploitation of inshore areas, gradual devaluation of the local currency, fuel cost increases), relative cost of fish substitutes, and changes in dietary preferences.

5.3 Supply

The government has several strategies to increase the national fish supply. These involve supporting the marketing of fishery products in Tongatapu from other parts of the country, deploying offshore fish aggregation devices, promoting aquaculture, and discouraging the use of destructive fishing techniques.

Major factors affecting the local supply of fish are over-fishing, destructive fishing, transport links to the outer islands, and the offloading of fish by the offshore fleet.

5.4 Trade

Exports of fishery products in 2007 were USD 2.8 million and represented about 36 % of all exports of the country. The major exports by value were tuna (29%), live rock[30] (21%), soft coral (12%), deepwater demersal fish (11%), and aquarium fish (10%).

5.5 Food security

Fish is an important element of food security in Tonga. The FAO Food Balance Sheets show that in 2007 fish contributed an average of 13.5% of all protein to the diet and 23.4% of animal protein. In rural areas of the country the contributions are much higher.

[30] 'Live rock' is a piece of dead coral rock encrusted with coraline algae and other organisms

Animal protein substitutes for fish consist mainly of various types of imported meat, much of which are extremely fatty and have negative health implications.

5.6 Employment

TSD (2004)[31] gives the results of a 2003 survey of employment in the country. In 2003 there were a total of 34 561 people employed in Tonga, of which 1 050 were employed in the category of "fishing". Fishing employment therefore represented 3% of the employment in the country during that period. Of those employed in fishing, 180 (17%) were females.

Tonga Fisheries Project (2005)[32] gives the results of the Tongan Seafood Socio Economic Survey. It estimated the number of people engaged in fishing activities: Tongatapu, 6 470; Ha'apai, 2 053; Vava'u, 4 375. The survey gave the percentage of self-employed that are fishers: Tongatapu, 5%; Ha'apai, 18%; Vava'u, 7%. The survey also found that of the households surveyed, about 64% at Tongatapu fished for their own supply of seafood and gifts to others. The corresponding figures for Vava'u and Ha'apai were 80% and 82%, respectively.

An important component of fisheries employment in Tonga are those jobs related to offshore fishing. A study by the Forum Fisheries Agency[33] tracked the number of Tongan citizens employed in the country's offshore fishing industry (both onboard and in processing plants) over a seven-year period:

Employment in the Tuna Fisheries of Tonga

	2002	2006	2008
Local Jobs on Vessels	161	75	45
Local Jobs in Shore Facilities	85	35	35
Total	**246**	**110**	**80**

5.7 Rural development

The Fisheries Division maintains offices and staff in several locations outside of the main urban area of Nuku'alofa: Vava'u, Ha'apai, 'Eua, and Niuatoputapu. One of the major objectives of these outposts is to promote fisheries development. This is carried out through a variety of ways, including market facilitation, advice on fisheries management, deployment of offshore fish aggregation devices, and provision of ice-making equipment.

6. FISHERY SECTOR DEVELOPMENT

6.1 Constraints and opportunities

Some of the major constraints of the fisheries sector are:

- Many of the inshore fishery resources, especially those close to the urban markets, are fully or over-exploited.
- The open-access nature of Tonga's inshore fisheries creates a negative incentive to conserve resources for the future: the first-come-first-served regime now prevailing is an incentive to harvest as much as possible, as fast as possible.
- Small-scale fishers cannot economically access the relatively abundant offshore fishery resources.
- There are considerable difficulties associated with marketing fishery products from the remote areas where abundance is greatest to the urban areas where the marketing opportunities are greatest.
- Aquaculture is, to some degree, stuck in the phase of the Fisheries Division growing organisms in tanks.
- There is some degree of miscommunication between the Fisheries Division and fishery stakeholders

[31] TSD (2004). Report on the Tonga Labour Force Survey 2003. Tonga Statistics Department, Nuku'alofa.
[32] Tonga Fisheries Project (2005). Tongan Seafood Socio Economic Survey. Tonga Fisheries Project.
[33] Gillett, R. (2008). A Study of Tuna Industry Development Aspirations of FFA Member Countries. Forum Fisheries Agency, Honiara, 70 pages.

The opportunities in the fisheries sector include:

- Expansion of the Special Management Area concept (communities acquiring management control over adjacent inshore fisheries) to other island communities in Tonga.
- Making the transition from the Fisheries Division raising organisms in tanks to the creation of a viable aquaculture industry.
- Increasing the effectiveness of the Fisheries Division by creating incentives to promote private sector development.
- Enhancement of the input of private sector associations into the functioning of the Fisheries Division.

6.2 Government and private sector policies and development strategies

The clearest articulation of the government's policies and development strategies in fisheries is found in the goals of the Fisheries Division Strategic Plan 2007-2011. Those are:

- Goal 1: Improve fisheries investments through 15% fleet development for longline fisheries and promotion of sub-regional access agreements.
- Goal 2: Strengthen and develop aquaculture through promotion of commercial farming for export and supporting coastal community development through stock enhancement.
- Goal 3: Increase employment opportunities equivalent to at least 10% of current level of employment, through training and development of fisheries skills in the fisheries industry.
- Goal 4: Improve fisheries information and catch data on resource status through strengthening of existing data management framework and reporting process.
- Goal 5: Strengthen existing, and explore new, fisheries markets.
- Goal 6: Increase production by 15% through opening of closed fisheries, research new fisheries, and scientific monitoring of existing fisheries in order to better target fishing effort.
- Goal 7: Improve fisheries governance through increased participation of fisheries stakeholders in fisheries management and in the decision making process.
- Goal 8: Continue to support Community Based Management capacity building, enforcement capability, and expansion of Special Management Areas for sustainable food supply.
- Goal 9: Promote the creation of integrated programs and income generating opportunities for coastal communities.
- Goal 10: Continue to strengthen the integrated approach to coastal fisheries management and development through close working partnerships and coordination with relevant agencies.
- Goal 11: Match national fisheries management and development with on-going regional and international fisheries development.
- Goal 12: Continue strengthening fisheries compliance through capacity building.
- Goal 13: Continue strengthening organisational capacity and capability.

The private sector's policies are not formalized. Judging from the attitudes and recent action of the companies engaged in offshore fishing, the main policy is not one of expanding but rather surviving during a period of poor profitability – as has been the case for the last few years. In deepwater bottom fishing, the sole remaining large fishing/exporting company has a policy of diversification: not "putting all the eggs in the bottom fish basket", but extending out into retail sales (including meat/wine) and into tuna longlining. In the bêche-de-mer fisheries, most private sector participants have the attitude of harvesting as much as possible before the fishery closes (last time it closed for 10 years).

6.3 Research

A very large number of fisheries research projects have been carried out in Tonga. Most areas of Tonga and most types of resources have been covered by various research endeavors. The older research is listed in the Tonga Fisheries Bibliography[34]. The results of many of the research projects are summarised by resource in the Tonga Fisheries Profiles[35]. Research projects in the 1990s are summarized in the FAO/AusAID Tonga Fisheries Sector Review[36]. The latter document contains sections on:

- Past and present fisheries research in Tonga
- Planned fisheries research
- Prioritization of fisheries research
- The mechanism by which important research needs are translated into research activities
- Specific suggestions for improving current resource monitoring
- Research activities required by community-based management
- The involvement of the ministry in tuna research
- Procurement of data from the commercial operators
- Suggestions for improving fisheries research in Tonga

Current fisheries research in Tonga by the Fisheries Division includes that related to tuna, giant clams, and deepwater demersal fish. Major issues in fisheries research are translating research needs into research activities, analysis of data collected by research projects, and funding for research.

6.4 Education

Education related to fisheries in Tonga is undertaken in a variety of institutions:

- Academic training in biological, economic and other aspects of fisheries is given at the University of the South Pacific in Suva, and to a lesser extent at universities in New Zealand, Australia, Japan, and the United Kingdom.
- The Tonga Maritime Polytechnic Institute has courses on small boat safety and for the certification of vessel officers.
- Training courses, workshops and attachments are frequently organized by the regional organizations: the Secretariat of the Pacific Community in New Caledonia and by the Forum Fisheries Agency in the Solomon Islands. The subject matter has included such diverse topics as fish quality grading, stock assessment, seaweed culture, fisheries surveillance, and on-vessel observing.
- Courses and workshops are also given by NGOs and by bilateral donors, such as those by Japan.

6.5 Foreign aid

The latest Fisheries Division annual report indicates that donor funding is responsible for about 12% of the expenditure of the Fisheries Division. "Overseas Donor Funding (In-kind)" is responsible for an additional 32%.

The largest donor initiative in Tonga's fisheries sector in recent years was the Tonga Fisheries Project, sponsored by Australia. This multi-year project was completed in 2008 and covered institutional strengthening of the Fisheries Division, renovation of the Fisheries Division offices, offshore/coastal fisheries management, and fisheries legislation.

Japan has been the major donor supporting aquaculture in Tonga. The Japanese International Cooperation Agency (JICA) funded the construction of the Tongan Mariculture Centre in 1978, and its refurbishment in 1991 after damage by a major cyclone in 1982. JICA has also provided aquaculture experts, training, materials and operating support to Tonga through in-kind technical assistance programmes.

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[34] Gillett, R. (1994). Tonga fisheries bibliography: 1st Revised Edition. Pacific Islands Marine Resource Information System, University of the South Pacific, and Technical Cooperation Programme, Food and Agriculture Organization of the United Nations, 115 pages.

[35] Bell, L. (1994). Fishery Resource Profiles – Kingdom of Tonga. Report 94/5, Forum Fisheries Agency, Honiara.

[36] Gillett, R., P.Cusack, W.Pintz, G.Preston, B. Kuemlangan, C.Lightfoot, H.Walton, and D.James (1998). Tonga Fisheries Sector Review, Volume I: Main Report of the Consultants. Food and Agriculture Organization of the United Nations and Australian Agency for International Development, 132 pages.

Current donors include the USA (Peace Corps volunteer), the European Union (fish market renovation), Australia (aquaculture), and Japan (fish aggregation devices).

7. FISHERY SECTOR INSTITUTIONS

The main government fisheries institution is the Fisheries Division. In the early 1990s the Fisheries Division was elevated to a Ministry of Fisheries, and then in 2006 the Ministry was downgraded to a division within the Ministry of Agriculture and Food, Forests and Fisheries.

The current Fisheries Division budget is about T$1.2 million (USD 600 000). There are about 60 established positions. Most of the staff are based at the Fisheries Division complex in Sopu to the west of Nuku'alofa. Additional staffs are located in Vava'u, Ha'apai, 'Eua, and Niuatoputapu.

Currently, the Fisheries Division has two main sections, Corporate Services and Technical. The various entities under these two sections are:

Corporate services:

- Finance/Budget
- Administration
- Information technology
- Asset management
- Outer islands

Technical:

- Monitoring, control and surveillance
- Research
  - Offshore
  - Inshore
  - Aquaculture
- Management
  - Industry
  - Policy

Other institutions that are important to fisheries in Tonga are the Fishing Industry Association of Tonga (represents the larger fishing companies), and the Tonga National Fishing Association (represents mainly the smaller fishing operations). Attempts are currently being made to establish an umbrella association that would represent both associations as the main interface between fishers and the government.

Some of the important internet links related to fisheries in Tonga are:

- www.tongafish.gov.to − the website of the Tonga Fisheries Division; contains information on legislation, management plans, applications for licences, publications, contact details for key fisheries officials
- www.spc.int/coastfish/Countries/Tonga - Information on Tonga fisheries, links to other sites
- www.pmo.gov.to/index.php/Department-of-Fisheries-Special-Management-Area.html - a description of the Special Management Areas
- www.tonganfishers.org − the website of the Fishing Industry Association of Tonga (FIAT)

8. GENERAL LEGAL FRAMEWORK

The main laws related to fisheries and aquaculture in Tonga are the Fisheries Management Act 2002 and the Aquaculture Management Act 2003.

The main features of the Fisheries Management Act 2002 are:

- The Minister shall, subject to this Act, be responsible for conservation, management, sustainable utilisation and development of fisheries resources in the Kingdom and the fisheries waters.
- The Minister shall establish a Fisheries Management Advisory Committee which shall advise him on matters relating to the conservation, management, sustainable utilization and development of fisheries in the Kingdom.
- The Minister shall, in consultation with the Fisheries Advisory Committee, determine the total allowable catch or total allowable level of fishing with respect to any stock of fish subject to the provisions of this Act or as provided in a fisheries management agreement.
- The Secretary shall progressively prepare and keep under review plans for the conservation, management, sustainable utilisation and development of fisheries in the fisheries waters and ensure the implementation of such fishery plans.
- The Secretary shall maintain or cause to be maintained a Fishing Vessels Register. No fishing vessel shall be operated in the fisheries waters and no Tongan ship shall be used in or outside the fisheries waters for fishing unless such vessel or ship has been registered on the Fishing Vessels Register.
- The Minister may by Order published in the Gazette, declare any area of the fisheries waters and corresponding subjacent area to be a Special Management Area for purposes of coastal community management, application of certain conservation and management measures, subsistence fishing operations or other specified purpose.
- The Minister may, in consultation with the Committee, designate any local community in Tonga to be a coastal community for the purposes of community based fisheries management and may prescribe the rights and responsibilities of such coastal community in respect of the Special Management Areas or part thereof.
- No person shall export any fish or fish product without a fish export licence issued in accordance with this Act.

Main features of the Aquaculture Management Act 2003 [37] are:

- Responsibility of the Minister: The Minister shall be responsible for the control, management and development of aquaculture and any related activity, whether on land or in any aquatic areaincluding marine areas.
- Aquaculture management and development plan: The Minister shall prepare and keep under regular review a plan for the management and development of aquaculture which shall be published in the Gazette.
- Codes of practice: The Minister may, in consultation with the Aquaculture Advisory Committee, issue and publish codes of practice. The Minister shall ensure that a copy of every code of practice is available for inspection by the public during business hours and copies of the whole or any part of that code shall be provided, upon payment of the prescribed fee. The failure to comply with a code of practice shall be taken into consideration in the grant or disqualification of any authorisation under this Act.
- Aquaculture Advisory Committee: There shall be established an Aquaculture Advisory Committee to advise the Minister on policy, planning and guidelines for the regulation, management and development of aquaculture; and any matter on which the Minister or the Secretary is required to consult the Advisory Committee under this Act.
- Aquaculture to be conducted in accordance with this Act: Aquaculture and related activities shall only be conducted: by persons who hold an aquaculture development licence or otherauthorisation issued in accordance with this Act; within aquaculture areas; and in accordance with this Act and any regulations or orders made under this Act.
- Licence conditions: An aquaculture development licence:
    - shall be valid for the period stated in the licence which shall not exceed 10 years;
    - shall not be used for any purpose other than those purposes specified in the licence; and
    - shall be subject to any general terms and conditions which may be prescribed generally or in respect of the relevant type of aquaculture by regulations;

[37] A minor amendment to the Aquaculture Management Act 2003 was made in 2005, the Aquaculture Management (Amendment) Act 2005. This involved simply inserting the words "or the Waste Management Act 2005" after the words in one section.

- Environmental impact assessment: Holders of an aquaculture development licence or other authorisation shall take all reasonably practical measures to avoid or minimise pollution and any harmful environmental impact caused by aquaculture or related activity, including the discharge of effluent and the disposal of sludge.
- Exotic fish: The Secretary may by Notice in the Gazette designate any species of exotic fish and such designation of exotic fish shall be published. No person shall introduce or import, possess, culture, sell or export any exotic fish without the written authorisation of the Secretary.

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