

RECONSTRUCTION OF TOTAL MARINE FISHERIES CATCHES FOR THE PITCAIRN ISLANDS (1950–2009)¹

Devraj Chaitanya, Sarah Harper, and Dirk Zeller

*Sea Around Us Project, Fisheries Centre, University of British Columbia,
2202 Main Mall, Vancouver, BC, V6T 1Z4, Canada*
devraj.c@gmail.com; s.harper@fisheries.ubc.ca; d.zeller@fisheries.ubc.ca

ABSTRACT

Total marine catches were estimated for the Pitcairn Islands for 1950–2009. A catch reconstruction method was used to estimate both subsistence (non-commercial) and artisanal (commercial) catches. Our reconstruction indicates that from 1950–2009,² Pitcairn Islands' marine catches were more than six times greater than the data reported by the FAO on behalf of the Pitcairn Islands would suggest. This is likely due to artisanal catches and changes in human population levels that were not accounted for by the data provided to the FAO. Overall, our results determined that the reconstructed catches for the Pitcairn Islands, which include subsistence and artisanal sector catches, totalled 1,016 tonnes for the period 1950–2009, with 28 t·year⁻¹ in 1950, declining to 13 t·year⁻¹ by 2009.

INTRODUCTION

Pitcairn, Henderson, Ducie and Oeno are the four small islands which comprise the Pitcairn Island group (Figure 1). The islands are located in the central South Pacific roughly 5,300 km from New Zealand and 6,400 km from Chile (Steinberg and McDowell 2003). The closest country to the Pitcairn Island group is French Polynesia, which is approximately 2,000 km to the north-west (Adams and Langley 2005). Due to remoteness and erratic weather conditions, the most accessible route to the Pitcairn's is from the nearest inhabited island of Mangareva (over 483 km away) in French Polynesia. Pitcairn Island is only accessible by boat though there is no good harbor or beach, and steep cliffs and tumultuous waters make landings difficult (Johnson 2007). There is no air strip on the island and air transportation is not possible due to the island's position at the intersection of two major wind fronts (Steinberg and McDowell 2003). The Pitcairn Island group is the last remaining British Overseas Territory in the Pacific. Pitcairn Island became a British dependency on November 29, 1838 (Nicolson 1965). Henderson Island, Oeno Atoll, and Ducie Atoll were included in the dependency in 1938 (Chapman 2004) but are uninhabited. Presently, the Pitcairn Island group is administered by the British High Commissioner to New Zealand with the assistance of an Island Council which is locally elected on Pitcairn Island (Steinberg and McDowell 2003).

The Pitcairn Islands are located between 23° and 26° S and 124° and 131° W. The four islands combined have a total land area of about 47 km² and a total EEZ area of approximately 836,000 km² of subtropical ocean.^{3,4} International waters encircle most of the Pitcairn Islands EEZ with the exception of a shared western EEZ border with French Polynesia (Adams and Langley 2005).

Topographically, Pitcairn is the only volcanic island of the island group, rising approximately 300 m above sea level (Sharples 1994). The island experiences a subtropical climate with mean monthly temperatures ranging from 24°C in January

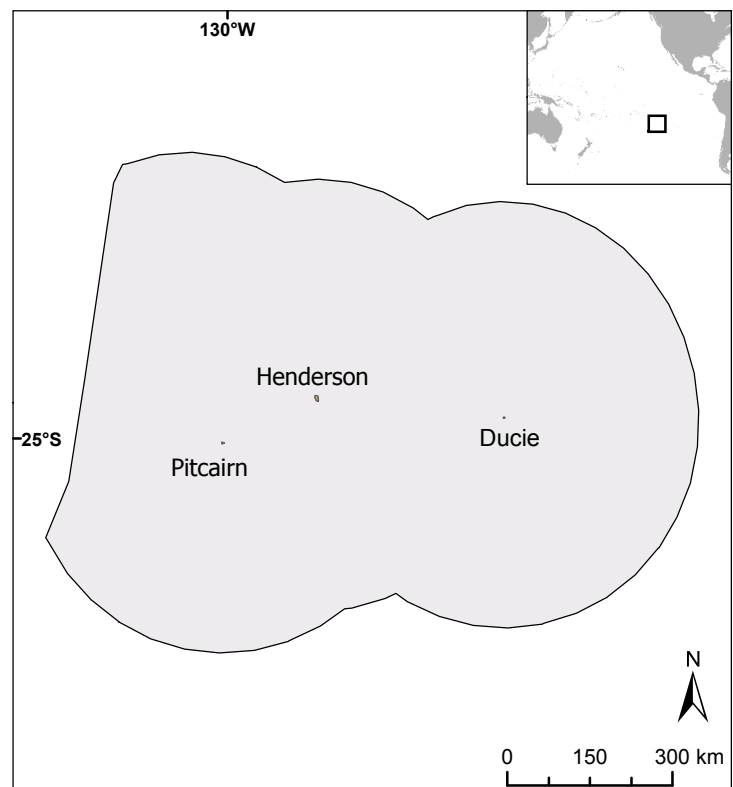


Figure 1. Location of Pitcairn Islands. The solid line represents the EEZ.

¹ Cite as: Chaitanya, D., Haper, S., and Zeller, D. (2012) Reconstruction of total marine fisheries catches for the Pitcairn Islands (1950–2009). pp. 87–94. *In*: Harper, S., Zylich, K., Boonzaier, L., Le Manach, F., Pauly, D., and Zeller D. (eds.) Fisheries catch reconstructions: Islands, Part III. Fisheries Centre Research Reports 20(5). Fisheries Centre, University of British Columbia [ISSN 1198-6727].

² See addendum for updating dataset to 2010.

³ <https://www.cia.gov/library/publications/the-world-factbook/geos/pc.html>; accessed August, 2011

⁴ <http://www.seaaroundus.org/eez/612.aspx>; accessed August, 2011

to 19°C in July, and an average annual rainfall of about 2,000 mm (Sharples 1994). Natural hazards such as cyclones generally occur between November and March.³

Henderson is a raised coralline limestone atoll situated approximately 169 km from Pitcairn (Sharples 1994). In 1989, Henderson Island was declared a UNESCO World Heritage Site as a bird sanctuary. Four species of birds are unique to the Island, namely, the Henderson fruit dove (*Ptilinopus insularis*), Henderson rail (*Porzana atra*), Henderson warbler (*Acrocephalus taiti*), and Henderson lorikeet (*Vini stephensi*).⁵ Henderson Island is uninhabited, arid, only has one known freshwater source and is considered the only pristine, forested atoll in the world. Brooke *et al.* (2004) note that the island has been estimated to have existed for about 380,000 years and it is presumed that the caves on the island were occupied by ancient Polynesian inhabitants of Henderson. Presently, Henderson serves the people of Pitcairn as an economic resource supply centre for the harvesting of *miro* and *tou* trees. These *miro* and *tou* trees are mainly used for the carving of curios, which are eventually sold to visitors and cruise ship passengers. The curios are considered essential to the economic well-being of the islanders (Brooke *et al.* 2004). Oeno and Ducie are the other two uninhabited atolls that are seldom visited and they generally remain undisturbed.

Of the four islands, only Pitcairn is presently inhabited. Historically, archaeological evidence indicates the occupation of the island by Polynesian people from about 1000–1300 A.D. (Johnson 2007). Currently, the island is inhabited by mostly seventh generation descendants of Fletcher Christian, eight other *HMS Bounty* mutineers, twelve Tahitian women and six Tahitian men.⁶ The population of Pitcairn is almost entirely concentrated in the capital of Adamstown, named after the iconic leader John Adams, the sole male survivor of the original 1790 settlement. The Island itself is named after Major Pitcairn of the British Marines.⁶

Historically, Pitcairn's economy was based on subsistence agriculture (including crops such as coffee, bananas, sweet potatoes, taro, oranges and sugar cane), philately, and sale of handicrafts and fish.⁵ Most products were sold to passing ships traveling between New Zealand and Panama (Adams and Langley 2005). For decades, Pitcairn's economic strategy has emphasized the marketable image of Pitcairn being a "postage stamp republic", or a market for stamp collectors (Steinberg and McDowell 2003). The sale of stamps has been and still is a major source of the country's revenue. However, with the advent of the digital revolution and the development of internet and email, the Pitcairn philately based economy has proven to be no longer sufficient to sustain the economic independence of the tiny island of forty-eight people.⁵ The use of postage stamps has died out mainly due to email services (Pitcairn Miscellany, 2006). Leslie Jaques, the former New Zealand based Commissioner of Pitcairn Island has reported that the financial situation on Pitcairn Island is severe. He states that, "Pitcairn is now officially under Budgetary Aid to maintain the island [which has] lost approximately NZ\$1.6 million over the last four years" (Maple 2004). With an annual budget of approximately NZ\$1 million, Pitcairn continues to generate revenue from the sale of postage stamps and a recent phenomenon has been the sale of internet domain addresses particularly the issuing of its ccTLD (country code Top Level Domain) .PN. However, lack of easy accessibility, entrepreneurship, infrastructure, distance from foreign markets, small domestic market, and inadequate policies towards business make Pitcairn's economic outlook less encouraging (Hannesson 2008). Moreover, a perceived lack of facilities, activities and attractions on the island, in addition to tumultuous waters and unpredictable weather stigmatize and hinder Pitcairn's tourism image (Amoamo 2011). Therefore, the island council has taken action and initiated Keynesian economic projects on the island, which address infrastructure issues for the purposes of stimulating the tourism sector. Upgrades of Bounty Bay (the only landing site for visitors), reconstruction of the Hill of Difficulty, the jetty and the slipway are examples of such projects (Maple 2004). Moreover, recent free trade and tourism agreements between Pitcairn and French Polynesia are expected to stimulate the economy (Maple 2004). In addition, news of a Japanese company interested in purchasing an order of 1,000 units of Pitcairn Island honey as well as other Pitcairn produce may encourage the agricultural sector to consider increasing commercial production for purposes of increasing revenue (Maple 2004). Overall, Pitcairners are expecting that future projects including fishing, honey production and eco-tourism will improve the island's current fiscal condition to a state of "self-sufficiency" (Maple 2004).

Pitcairn's economic potential is great. For example, minerals including manganese, iron, copper, gold, silver and zinc, have been discovered within the exclusive economic zone. However, the labor force to exploit this ocean region is insufficient and the monetary resources required to produce a domestic mining industry are far greater than the Pitcairn budget. Contracting foreign companies and charging access fees may be a possible avenue for revenue generation and industrial development of ocean resources.

In this paper, we focus on Pitcairn's fisheries sector. Pitcairn, like many of the other Pacific Island countries, has a tradition of eating fish. As a result of remoteness and limited opportunities for earning income this has led to almost all fishing to be subsistence fishing (Gillett 2009). More importantly, Pitcairn still depends on fresh fish to provide the majority of the animal protein required for good nutrition (Bell *et al.* 2009). The expansion of Pitcairn's fisheries sector for economic development is a topic of great interest, especially since future forecasts do not expect food security issues for the island (Gillett 2009).

In a region defined by an abundance of tuna, a pelagic fishery would seem to be the most applicable industry for economic stimulation. However, Adams and Langley (2005) argue that tuna fisheries or coastal fisheries in general will not be sufficient for Pitcairn Island to sustain economic independence. Moreover, it is not a sustainable approach to economic independence (Adams and Langley 2005). Due to subtropical waters, weather, and ocean hydrology, pelagic fish catches are not common, specifically because of markets being difficult to access, and the fact that Pitcairn "has a small area of fishable shelf" (Adams and Langley 2005). Moreover, the likelihood of a substantial

⁵ http://www.thecommonwealth.org/YearbookInternal/140416/140428/pitcairn_islands__pitcairn__henderson__ducie_and_o/; accessed August, 2011

⁶ <http://library.puc.edu/pitcairn/pitcairn/index.shtml>; accessed August, 2011

catch of skipjack and yellowfin is low (Adams and Langley 2005). Therefore, Adams and Langley (2005) conclude that the Pitcairn zone cannot support any significant pole-and-line or purse-seine fisheries. In addition, they state that it will not be profitable for the Pitcairn government to invest in commercial fisheries since it entails large investment and maintenance costs that will more likely harm than stimulate the economy. Moreover, Hannesson (2008) argues that fishing is only a part of a fishery's processes. The other major part is the transformation of the fish into a "saleable product," in addition to the careful handling and transportation of the product to foreign markets (Hannesson 2008).

Overall, the general purpose of this study is for the identification of information gaps in the FAO reported fisheries catches for the Pitcairn Islands. The specific purpose of this study is to estimate the total fisheries catches for Pitcairn Islands from 1950-2009, including all fisheries sectors (i.e., subsistence and artisanal catches). As previously mentioned, almost all catches on Pitcairn Island are subsistence catches (Gillett 2009). The resources available to provide estimates of subsistence catches are limited, and our approach is an assumption based approach using information found in the academic and grey literature. This report presents the best estimate of all small-scale catches and artisanal landings for the Pitcairn Islands from 1950-2009.

METHODS

Human population data

Human population data were derived from the Pitcairn Study Centre census database. Years between census points were interpolated linearly to estimate population time series (Figure 2). Pitcairn Island is the only inhabited island in the Pitcairn Island Group,⁶ and fluctuations in the population are explained through historical analysis. The main driver of island population fluctuations is determined by environmental factors including: unsustainable resource exploitation, limited land area, resource depletion, insufficient governance practices, and inability to sustain subsistence level of food security.⁵ Demographics, including an aging population base, declining population, and emigration also play a substantial role in population fluctuations (Amoamo 2011).

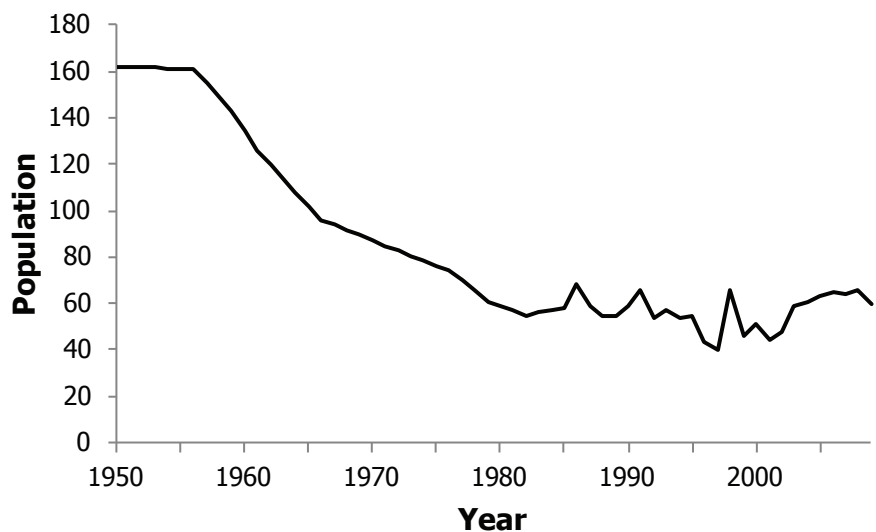


Figure 2. Population estimates for the Pitcairn Islands, 1950-2009.

Presently, 29% of the island population is over 60 years of age with Mr. Len Carlyle Brown being the oldest Pitcairn resident at age 85.⁶ The aging population base has resulted in the Pitcairn Island labour force being limited to "8 or 9 hard core fishers" in addition to 3 or 4 regular fishers (Gillett 2009). Moreover, "women and men fished regularly from the rocks, mainly for a fish locally called *nanwi* [*Kyphosus bigibbus*], for the evening meal" (Gillett 2009). As of 2011, only 48 inhabitants reside on Pitcairn Island, mostly seventh generation descendants of the Bounty mutineers.³ Depopulation as a result of outmigration, predominantly to New Zealand, has led to the population declining from a peak of 233 in 1937 to 60 residents in 2009, to its present population of 48 (Figure 2).

Subsistence Fisheries

Both the academic and grey literature was thoroughly reviewed for data pertaining to subsistence fisheries in Pitcairn Island. *Per capita* catch data referring to subsistence and artisanal fishing were found for Pitcairn Island. Most information on fisheries and subsistence and artisanal catches, was derived from Gillett (2009), Sharples (1994), Adams and Langley (2005) and Dalzell *et al.* (1996). According to Gillett (2009), subsistence fishing produces the majority of all the fish consumed. Consumption is estimated at 140 kg-person⁻¹·year⁻¹ (Gillett 2009). Gillett (2009) estimates that if the population of Pitcairn was 50 inhabitants, the 140 kg per capita annual consumption would result in a subsistence catch of seven tonnes per year. Dalzell *et al.* (1996) notes that Pitcairn's annual subsistence fisheries production was 8 metric tonnes in the early 1990s.

Our methodology, consisting of using the consumption information derived from Gillett (2009) for Pitcairn Island, was used to estimate the total subsistence catch for the island. The consumption rate of 140 kg-person⁻¹·year⁻¹ was held fixed back to 1950. Once the total subsistence catch for the island was derived, we estimated the taxonomic composition with information from Gillett (2009), Sharples (1994), Adams and Langley (2005) and Dalzell *et al.* (1996).

Adams and Langley (2005), Dalzell *et al.* (1996) and Sharples (1994) present counts of individual taxa on the Pitcairn Islands, which provides general information pertaining to subsistence fishing. This aided the formulation of our assumptions and provided detailed information on taxa found in and around the Pitcairn Islands. These data were used to create an assumed taxonomic composition of reconstructed subsistence catches (Table 1).

Artisanal Fisheries

Most information from the literature pertaining to artisanal fisheries catches is derived from Gillett (2009) who estimates that the catch taken for commercial purposes is approximately five tonnes. Many artisanal fishers sell catches to the occasional passing cruise ships and private yachts. Sharples (1994) reports that the standard price of all fish was NZ\$5/kg. According to Gillett (2009), in the year 2007, the commercial catch of five tonnes was worth NZ\$51,000. We assumed this catch volume was constant over the time period. An assumed taxonomic composition was also created for the artisanal setor (Table 1).

Table 1. Taxonomic composition of subsistence and artisanal catches on Pitcairn Island as informed by Adams and Langley (2005), Dalzell *et al.* (1996) and Sharples (1994).

Taxon name	Percentage of total subsistence catch (%)	Percentage of total artisanal catch (%)
<i>Etelis carbunculus</i>	-	20
<i>Pristipomoides</i> spp.	-	20
other Lutjanidae	10	10
<i>Kyphosus bigibbus</i>	20	-
other Kyphosidae	10	-
<i>Epinephelus fasciatus</i>	20	-
<i>Variola louti</i>	-	20
other Serranidae	10	10
<i>Panulirus penicillatus</i>	5	5
<i>Scyllarides</i> spp.	5	5
Miscellaneous invertebrates	10	-
Miscellaneous marine fishes	10	10

RESULTS

Subsistence catches

Overall subsistence catches totalled 716 tonnes for the period of 1950-2009 (Figure 3a). Subsistence catches declined throughout this period due to a declining population. Fluctuations in estimated catches over this time period are entirely due to population fluctuations, with average catch declining from 22 t·year⁻¹ to approximately 8 t·year⁻¹ by 2009 (Figure 3a). Subsistence catches were dominated by the fish species *Epinephelus fasciatus* and *Kyphosus bigibbus*. Lutjanidae, other Serranidae, Miscellaneous marine fishes (MMF), other Kyphosidae, and Miscellaneous Invertebrates (MI) also provided substantial amounts of catch (Figure 3b). Other species caught include *Scyllarides* spp., and *Panulirus penicillatus* (Figure 3b).

Artisanal catches

Artisanal catches totalled 300 tonnes over the 1950-2009 period (Figure 3a). Transportation issues, erratic weather patterns, rough seas and a lack of tourist accessibility to the island have contributed to the absence of substantial artisanal catches over this period; however, such inter-annual variability are not represented in our data. Amoamo (2011) estimates that about 40 cruise ships pass the Pitcairn Islands, however, only eight to ten ships stop at Pitcairn. Consequently, this produces a total of 2,500 to 3,000 visitors during the October to March cruise season

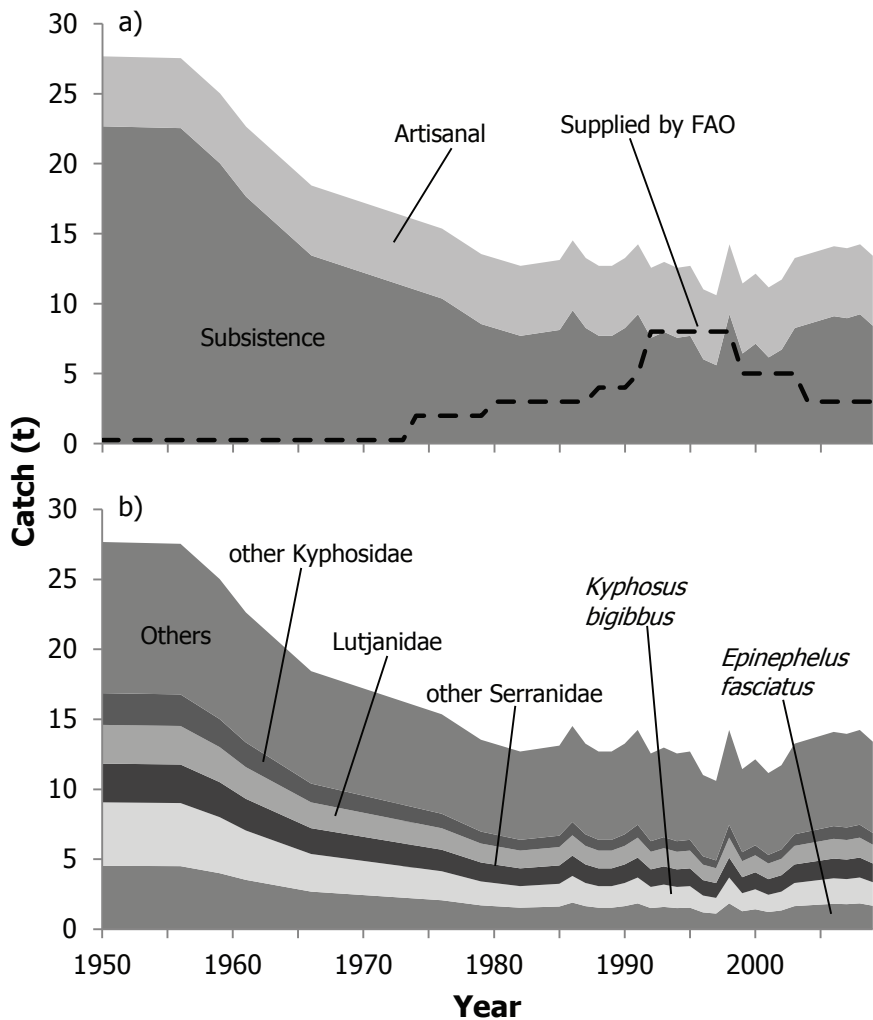


Figure 3. a) Total reconstructed catch by sector for the Pitcairn Islands compared to landings as presented by the FAO, 1950-2009, and b) Total reconstructed catch by major taxa.

(Amoamo 2011). The immediate result of this lack of transportation infrastructure is its negative impact on tourism, which has further restrained the development of Pitcairn Island artisanal fisheries (Amoamo 2011). Artisanal catches were dominated taxonomically by *Variola louti*, *Etelis carbunculus*, and *Pristipomoides* spp. Other Serranidae, other Lutjanidae, *Panulirus penicillatus*, and *Scyllarides* spp. also contributed to catch (Figure 3b).

Total reconstructed catches

Overall reconstructed catches for Pitcairn Island, which included subsistence and artisanal sector catches, totalled 1,016 tonnes for the period 1950-2009 (Figure 3a). This catch total was more than six times the 158 t reported to FAO on behalf of Pitcairn Island for the same time period. Subsistence catches dominated with approximately 70% of total catches being subsistence and 30% being commercial over the 1950-2009 time period. Subsistence catches dominated during the 1950s when the population was around 160 people, representing approximately 82% of the total reconstructed catch compared to 18% commercial catch for that decade.

Foreign fleets in the Pitcairn Islands EEZ

Adams and Langley (2005) note that Taiwan, China, Japan, Republic of Korea and French Polynesia have been long-line fishing in the area of the Pitcairn Islands EEZ. Gillett (2009) informs us that there is only one accessible document noting the allowance of foreign vessels in the Pitcairn Islands EEZ. The agreement identifies 20 Japanese tuna long-line vessels as legal foreign based fleets within the Pitcairn Islands EEZ (Gillett 2009). Presently, according to Gillett (2009) based on personal communication with a Mr. D. Evans, a contract between Pitcairn Island and an unspecified agent led to the issuing of a license for a long-liner to fish in Pitcairn waters for a fee of NZ\$1000 (Gillett 2009).

DISCUSSION

Our estimate of total catches for Pitcairn Island was 1,016 tonnes for the period 1950-2009. This reconstructed catch total was more than six times the amount presented by FAO on behalf of Pitcairn Island for the same time period. In our reconstruction, approximately 300 tonnes of commercial catches and approximately 558 tonnes of subsistence catches were added to the FAO data.

Overall, Pitcairn faces as its major challenges the fundamental survival of its population. With a continuing ageing of the population base and associated out-migration of young people, the likelihood of long-term habitation of Pitcairn is put into question. Thus, it is likely that total catches may continue to remain low or further decline.

ADDENDUM

Since completing this reconstruction, the data has been carried-forward to 2010. We assumed the same total in 2010 as in 2009 and that both the sectoral and taxonomic breakdowns were the same.

ACKNOWLEDGEMENTS

We thank the *Sea Around Us* Project, a scientific collaboration between the University of British Columbia and The Pew Charitable Trusts.

REFERENCES

- Adams T and Langley A (2005) The Potential for Development of Fisheries in the Pitcairn EEZ. Secretariat of the Pacific Community Marine Resources Division, Noumea. 1-79 p.
- Amoamo M (2011) Remoteness and Myth Making: Tourism Development on Pitcairn Island. *Tourism Planning & Development* 8(1): 1-19.
- Bell JD, Kronen M, Vunisea A, Nash WJ, Keeble G, Demmke A, Pontifex S and Andrefouet S (2009) Planning the use of fish for food security in the Pacific. *Marine Policy* 33: 64-76.
- Brooke MdL, Hepburn I and Trevelyan RJ (2004) Henderson Island World Heritage Site: Management Plan 2004-2009. Foreign and Commonwealth Office London. ii + 42 p.
- Chapman L (2004) Nearshore Domestic Fisheries Development in Pacific Island Countries and Territories. Secretariat of the Pacific Community, Noumea. 161-164 p.
- Gillett R (2009) Fisheries in the Economies of the Pacific Island Countries and Territories. Asia Development Bank, Manila. 263-268 p.
- Hannesson R (2008) The exclusive economic zone and economic development in the Pacific island countries. *Marine Policy* 32: 886-897.
- Johnson CK (2007) Success and Struggles of Small Island Museums in Polynesia with Special Reference to Pitcairn Island. Master of Arts in Anthropology thesis, University of University of Nevada, Reno. ix + 110 p.

- Maple M (2004) Special Council Meeting. *The Pitcairn Miscellany* 47: 1–4.
- Nicolson R (1965) *The Pitcairners*. Angus and Robertson, Sydney. 222 p.
- Sharples P (1994) Pitcairn Island Fisheries Resource Survey—1994 Observer Trip Report. Secretariat of the Pacific Community, Noumea. 50 p.
- Steinberg EP and McDowell SD (2003) Mutiny on the bandwidth: the semiotics of statehood in the internet domain name registries of Pitcairn Island and Niue. *New Media & Society* 5(1): 47-67.

Appendix Table A1. FAO landings vs. total reconstructed catch (in tonnes), and catch by sector, for the Pitcairn Islands, 1950-2009.

Year	FAO landings	Total reconstructed catch	Subsistence	Artisanal
1950	0.25	28	22.7	5
1951	0.25	28	22.6	5
1952	0.25	28	22.6	5
1953	0.25	28	22.6	5
1954	0.25	28	22.6	5
1955	0.25	28	22.6	5
1956	0.25	28	22.5	5
1957	0.25	27	21.7	5
1958	0.25	26	20.9	5
1959	0.25	25	20.0	5
1960	0.25	24	18.8	5
1961	0.25	23	17.6	5
1962	0.25	22	16.8	5
1963	0.25	21	16.0	5
1964	0.25	20	15.1	5
1965	0.25	19	14.3	5
1966	0.25	18	13.4	5
1967	0.25	18	13.1	5
1968	0.25	18	12.8	5
1969	0.25	18	12.5	5
1970	0.25	17	12.2	5
1971	0.25	17	11.9	5
1972	0.25	17	11.6	5
1973	0.25	16	11.3	5
1974	2.00	16	11.0	5
1975	2.00	16	10.7	5
1976	2.00	15	10.4	5
1977	2.00	15	9.8	5
1978	2.00	14	9.1	5
1979	2.00	14	8.5	5
1980	3.00	13	8.3	5
1981	3.00	13	8.0	5
1982	3.00	13	7.7	5
1983	3.00	13	7.8	5
1984	3.00	13	8.0	5
1985	3.00	13	8.1	5
1986	3.00	15	9.5	5
1987	3.00	13	8.3	5
1988	4.00	13	7.7	5
1989	4.00	13	7.7	5
1990	4.00	13	8.3	5
1991	5.00	14	9.2	5
1992	8.00	13	7.6	5
1993	8.00	13	8.0	5
1994	8.00	13	7.6	5
1995	8.00	13	7.7	5
1996	8.00	11	6.0	5
1997	8.00	11	5.6	5
1998	8.00	14	9.2	5
1999	5.00	11	6.4	5
2000	5.00	12	7.1	5
2001	5.00	11	6.2	5
2002	5.00	12	6.7	5
2003	5.00	13	8.3	5
2004	3.00	14	8.5	5
2005	3.00	14	8.8	5
2006	3.00	14	9.1	5
2007	3.00	14	9.0	5
2008	3.00	14	9.2	5
2009	3.00	13	8.4	5

Appendix Table A2. Total reconstructed catch (in tonnes) by major taxa for the Pitcairn Islands, 1950-2009.

Year	<i>Epinephelus fasciatus</i>	<i>Kyphosus bigibbus</i>	Other Serranidae	Lutjanidae	Other Kyphosidae	Others ¹
1950	4.5	4.5	2.8	2.8	2.3	10.8
1951	4.5	4.5	2.8	2.8	2.3	10.8
1952	4.5	4.5	2.8	2.8	2.3	10.8
1953	4.5	4.5	2.8	2.8	2.3	10.8
1954	4.5	4.5	2.8	2.8	2.3	10.8
1955	4.5	4.5	2.8	2.8	2.3	10.8
1956	4.5	4.5	2.8	2.8	2.3	10.8
1957	4.3	4.3	2.7	2.7	2.2	10.5
1958	4.2	4.2	2.6	2.6	2.1	10.3
1959	4.0	4.0	2.5	2.5	2.0	10.0
1960	3.8	3.8	2.4	2.4	1.9	9.6
1961	3.5	3.5	2.3	2.3	1.8	9.3
1962	3.4	3.4	2.2	2.2	1.7	9.0
1963	3.2	3.2	2.1	2.1	1.6	8.8
1964	3.0	3.0	2.0	2.0	1.5	8.5
1965	2.9	2.9	1.9	1.9	1.4	8.3
1966	2.7	2.7	1.8	1.8	1.3	8.0
1967	2.6	2.6	1.8	1.8	1.3	7.9
1968	2.6	2.6	1.8	1.8	1.3	7.8
1969	2.5	2.5	1.8	1.8	1.3	7.8
1970	2.4	2.4	1.7	1.7	1.2	7.7
1971	2.4	2.4	1.7	1.7	1.2	7.6
1972	2.3	2.3	1.7	1.7	1.2	7.5
1973	2.3	2.3	1.6	1.6	1.1	7.4
1974	2.2	2.2	1.6	1.6	1.1	7.3
1975	2.1	2.1	1.6	1.6	1.1	7.2
1976	2.1	2.1	1.5	1.5	1.0	7.1
1977	2.0	2.0	1.5	1.5	1.0	6.9
1978	1.8	1.8	1.4	1.4	0.9	6.7
1979	1.7	1.7	1.4	1.4	0.9	6.6
1980	1.7	1.7	1.3	1.3	0.8	6.5
1981	1.6	1.6	1.3	1.3	0.8	6.4
1982	1.5	1.5	1.3	1.3	0.8	6.3
1983	1.6	1.6	1.3	1.3	0.8	6.4
1984	1.6	1.6	1.3	1.3	0.8	6.4
1985	1.6	1.6	1.3	1.3	0.8	6.4
1986	1.9	1.9	1.5	1.5	1.0	6.9
1987	1.7	1.7	1.3	1.3	0.8	6.5
1988	1.5	1.5	1.3	1.3	0.8	6.3
1989	1.5	1.5	1.3	1.3	0.8	6.3
1990	1.7	1.7	1.3	1.3	0.8	6.5
1991	1.8	1.8	1.4	1.4	0.9	6.8
1992	1.5	1.5	1.3	1.3	0.8	6.3
1993	1.6	1.6	1.3	1.3	0.8	6.4
1994	1.5	1.5	1.3	1.3	0.8	6.3
1995	1.5	1.5	1.3	1.3	0.8	6.3
1996	1.2	1.2	1.1	1.1	0.6	5.8
1997	1.1	1.1	1.1	1.1	0.6	5.7
1998	1.8	1.8	1.4	1.4	0.9	6.8
1999	1.3	1.3	1.1	1.1	0.6	5.9
2000	1.4	1.4	1.2	1.2	0.7	6.1
2001	1.2	1.2	1.1	1.1	0.6	5.8
2002	1.3	1.3	1.2	1.2	0.7	6.0
2003	1.7	1.7	1.3	1.3	0.8	6.5
2004	1.7	1.7	1.4	1.4	0.9	6.6
2005	1.8	1.8	1.4	1.4	0.9	6.6
2006	1.8	1.8	1.4	1.4	0.9	6.7
2007	1.8	1.8	1.4	1.4	0.9	6.7
2008	1.8	1.8	1.4	1.4	0.9	6.8
2009	1.7	1.7	1.3	1.3	0.8	6.5

¹Others category includes *Variola louti*, *Etelis carbunculus*, *Pristipomoides* spp., *Panulirus penicillatus*, *Scyllarides* spp., 'miscellaneous marine fishes', and 'miscellaneous invertebrates'.