# Reconstruction of marine fisheries catches for the Kermadec Islands (1950–2010)[1]

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## Abstract

The Kermadec Islands are an isolated and uninhabited cluster of islands which have been the site of relatively little fishing. The total domestic (New Zealand) catch from the Kermadec Islands' Exclusive Economic Zone (EEZ) waters for the 1950-2010 time period was approximately 971 t. Foreign fishing was also estimated, as these fisheries had a greater impact on the area. The foreign fishery catch was estimated at 14,475 t over the time period. Approximately 80% of this was caught by South Korean vessels, with the other 20% caught by Japanese vessels. At present, there is very little fishing occurring in the Kermadec Region (only 28 t domestic and zero foreign catch in 2010).

## Introduction

The Kermadec Islands are the northernmost point of New Zealand (Figure 1). The group consists of four island groups which are (with the major islands listed) as follows: 1) Raoul Island, Meyer Island, and the Herald Islets; 2) Macauley Island and Haszard Islet; 3) Curtis and Cheeseman Islands; and 4) L'Esperance and Havre Rocks (Francis *et al.* 1987). The Kermadec Islands are peaks of volcanic formations rising from the Kermadec Ridge (Francis *et al.* 1987). Although the Kermadecs are part of New Zealand, the EEZ surrounding the islands is nearly separated from the EEZ of the main New Zealand EEZ (surrounding North and South Island), and thus we can refer specifically to the Kermadec Islands' EEZ (612,047 km²; A. Connell, pers. comm., New Zealand Ministry of Fisheries). The Kermadec region is formed by the subduction of the Pacific Plate under the Australian Plate. This not only creates an area of frequent earthquakes and active volcanoes but also forms the Kermadec trench which is over 10,000 m deep (Wright 2010). The Kermadec Islands are an important locale of unique and diverse terrestrial flora and fauna, and marine life due to their isolation and subtropical location which features a mixture of tropical, subtropical, and temperate species (Gardner *et al.* 2006). In 1934, the islands were declared a Flora and Fauna Reserve and then a Nature Reserve in 1977.[2] Starting in 1987, the New Zealand Department of Conservation has managed the islands and now have permanent staff and volunteers on Raoul Island who are responsible for monitoring meteorological and volcanic activity, weed and pest control, and enforcing regulations of the nature and marine reserves.[2] The islands are uninhabited except for the conservation staff on Raoul Island.[3] The territorial seas (12-mile limit surrounding the coastal edge) around each island and rock were declared marine reserves in 1990 (Eddy 2011). This reserve protects 748,000 ha (7,480 km²) of ocean (Gardner *et al.* 2006).

Due to the fact that the Kermadec Islands are part of New Zealand, they are not typically evaluated on their own. The purpose of this report is to assess how much fishing actually occurs in the isolated region of New Zealand's EEZ which surrounds the Kermadec Islands.

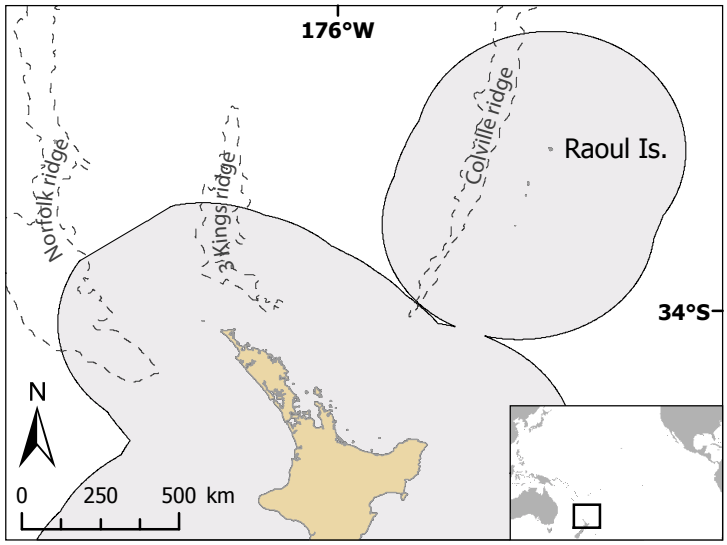


**Figure 1.** Map of the Kermadec Islands and its EEZ. Raoul Island is shown as well as the connection of the Kermadec Islands EEZ to the New Zealand EEZ surrounding North and South Island.

## Methods

To estimate the total fisheries catch within the Kermadec Island EEZ, both domestic and foreign fleets were assessed. For the Kermadecs, only large-scale commercial fleets need to be considered. The islands are uninhabited and thus there is no localized small-scale fishing occurring. New Zealand's EEZ is divided into ten Fisheries Management Areas

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[2] http://www.thekermadecs.org/islands [accessed January 10, 2012]

[3] http://www.doc.govt.nz/conservation/marine-and-coastal/marine-protected-areas/marine-reserves-a-z/kermadec/facts/ [accessed January 10, 2012]

(FMAs). The Kermadec Island's EEZ is categorized as its own management area, FMA10, and therefore, the New Zealand Ministry of Fisheries (known hereafter as the Ministry of Fisheries) collects data which are specific to the Kermadec Region. However, these data are only available starting in 1990. Prior to this, data relating to foreign fishing were available through various South Pacific Commission[4] (SPC) reports. As for domestic fishing, New Zealand did not have a deep-water fleet prior to 1990, and thus did not fish Kermadec waters at that time (G. Simmons, pers. comm., New Zealand Asia Institute). The Ministry of Fisheries website was also consulted to fit scientific names to the common names presented in the reported data.[5]

### *Domestic fisheries*

Domestic large-scale commercial catches for the 1990-2010 time period were obtained from the Ministry of Fisheries and were accepted as reported data. There were only a few changes made to the data; this affected taxonomic classification of the data, but not the tonnage value. Three categories provided combined data for two species. In these cases the catch was divided between the species. The alfonsino and long-finned beryx (*Beryx slendens* and *B. decadactylus*, respectively) formed a combined category and were each assigned 50% of the combined catch. The same rule was applied to black and yellowfoot paua (*Haliotis iris* and *H. australis,* respectively). Hapuku and bass (*Polyprion oxygeneois* and *P. americanus*, respectively) were treated slightly differently, as they were also present in the data as individual categories. Therefore, the proportion of hapuku to bass in the individual categories was used to divide up the combined category. The only amendment to the actual value of the data was to the "shark fins (unspecified)" category which needed to be converted to the equivalent whole shark weight. After contacting the Ministry of Fisheries, it was found that a conversion factor of 30 was used (C. Loveridge, pers. comm., Ministry of Forestry and Agriculture). This conversion factor was used to calculate the whole wet weight of shark from (what is assumed to be) the wet fin weight. The amount reported as fins was kept separate, labelled as shark ("Selachimorpha"), and was treated as landed catch which was added on to the other miscellaneous shark category. The difference between the whole weight and the fin weight was also labelled as shark ("Selachimorpha"), but was treated as discarded catch (i.e., discarded carcasses). Annual catches were set to zero prior to 1990, as there were no domestic vessels fishing in the Kermadec region of the EEZ at that time.

### *Foreign fisheries*

Foreign large-scale commercial catches for the 1990-2010 time period were obtained from the Ministry of Fisheries. This included catch by foreign licensed and foreign chartered vessel fleets. Foreign licensed vessels stopped fishing in New Zealand at the end of the 1994-95 fishing year (Francis *et al.* 2001). Records of foreign licensed vessels only appear for 1991 and 1992 in the Kermadec region. The official data only list five years in which foreign chartered vessels were present in Kermadec waters, the first year being 1997. Foreign licensed and foreign charter are different ways of managing foreign fleets, and therefore this gap in foreign fishing is assumed to be due to the changes in the management of foreign vessels. In this report, foreign licensed and foreign chartered vessels are treated the same. The official data for foreign vessels (licensed and chartered) were assumed to be representative of foreign catches and were not altered apart from proportioning the catches to the different foreign fleets.

Prior to 1990, there are many references to foreign vessels fishing in New Zealand's EEZ. Taiwanese, Chinese, and Soviet vessels have been identified as fishing in New Zealand's waters. However, these references referred to squid (*Nototodarus sloanii*), hoki (*Macruronus novaezelandiae*), or southern blue whiting (*Micromesistius australis*) fisheries which did not take place in the geographic location of Kermadec (Smith *et al.* 1981; Clark 1985; Chen *et al.* 2008). Only South Korean and Japanese vessels were able to be clearly identified as fishing in the Kermadec EEZ. In the 1980s, there were two foreign licensed longline tuna fisheries operating in New Zealand's EEZ. The southern fishery which was mainly comprised of Japanese vessels was restricted to the waters surrounding North and South Island and targeted southern bluefin tuna (*Thunnus maccoyii*; Murray *et al.* 1984). The northern fishery, which consisted mainly of Korean vessels (with a few Japanese vessels), was much smaller than the southern fishery and operated north of 34°S latitude targeting albacore tuna (*Thunnus alalunga*; Murray *et al.* 1984). This northern fishery was known to focus its effort around Kermadec as well as the Colville Ridge, Norfolk Ridge and the Three Kings Rise system (Figure 1; Murray *et al.* 1984).

SPC Country Statement reports on tuna fishing and resources in New Zealand, provided grids of 1° longitude by 1° latitude cells, showing catch data around New Zealand, which confirmed that the northern fishery did fish inside the Kermadec EEZ (Murray *et al.* 1984; Murray and Ross 1985). Bigeye tuna (*Thunnus obesus*) and yellowfin tuna (*Thunnus albacares*) were also present in the catch, along with swordfish (*Xiphias gladius*), known to be a by-catch item (Murray *et al.* 1984). The grids provided spatially allocated catch information in the form of number of sets and fish caught per set for albacore, bigeye tuna, and yellowfin tuna. Grids for the northern and southern fisheries were provided, and showed that both fleets obtained catches within the Kermadec EEZ. As the grids were labelled as "northern fishery" and "Japanese fishery", and were not explicit in differentiating the northern Japanese vessels, it was assumed that the northern fishery represented South Korean catches, and the Japanese fishery catches which fell into the Kermadec EEZ were part of the northern Japanese fisheries catches. These grids provided data from 1981-1984 for the South Korean fleet and 1980-1984 for the Japanese fleet. Additional reports provided average weights of fish for each fishing year (Murray *et al.* 1989).

[4] Now the Secretariat of the Pacific Community.

[5] http://www.fish.govt.nz/en-nz/International/High+Seas+Fishing/MFish+Approved+Species+Codes/MFish+Approved+Species+Codes+01.htm, [accessed January 5, 2012]

Information regarding the fleets' total catch (without spatial distribution graphs) was available from 1980 to 1988 (Murray *et al.* 1989). Unfortunately, these data included catches made outside of the Kermadec EEZ. Proportions and averages were used to extrapolate the data from the known catches in order to estimate catches from 1985 to 1988. Catches for the years 1989-1990 were estimated by interpolating between the 1988 estimates and the 1991 catches from the Ministry of Fisheries data. The target tuna (albacore, bigeye, and yellowfin) data for 1991-1992, 1997, 1999-2000, 2003, and 2007 for foreign vessels (from the Ministry of Fisheries data) were divided proportionally into South Korean and Japanese catches based on proportions from the 1988 tuna estimates (Table 1). Non-target data were divided using the average proportion of South Korean to Japanese catches in 1988 (Table 1). The Ministry of Fisheries data were assumed to be accurate and thus in years of zero data (excluding 1990), it was assumed that there were no foreign vessels fishing in Kermadec waters.

**Table 1.** Percentage of tuna catch within the Kermadec EEZ, by fishing country, in 1988.

| Species | Percentage (%) | |
|---|---|---|
| | South Korea | Japan |
| *Thunnus alalunga* | 86.33 | 13.67 |
| *Thunnus obesus* | 8.96 | 91.04 |
| *Thunnus albacares* | 83.01 | 16.99 |
| Average | 59.43 | 40.57 |

According to Francis *et al.* (1987), foreign vessels (Japanese, Korean, and Taiwanese) started longline fisheries in New Zealand in the early 1950s. It was assumed that these countries began re-building their fleets after World War II. Therefore, a starting point of zero in 1945 was used as an anchor point. Estimates were interpolated between zero in 1945 and the first data points in either 1980 or 1981, to give a complete time series of target tuna data. The data on non-target species from the Ministry of Fisheries for the foreign licensed vessels only, were used to estimate the non-target catch for the foreign fishery from 1950-1990. Foreign licensed catch data from 1991 and 1992 were averaged to obtain the proportion of target tuna to the non-target species (Table 2).

**Table 2.** Species composition of foreign vessel catches, within the Kermadec EEZ, for 1950-1990.

| Taxa | Catch (%) |
|---|---|
| Target Tuna[a] | 69.07 |
| *Xiphias gladius* | 7.73 |
| *Isurus oxyrinchus* | 6.36 |
| *Alopias vulpinus* | 2.91 |
| *Tetrapturus audax* | 2.79 |
| *Thunnus maccoyii* | 1.54 |
| *Gasterochisma melampus* | 0.53 |
| *Prionace glauca* | 0.13 |
| *Thunnus thynnus* | 0.11 |
| Miscellaneous marine fish | 5.88 |
| Miscellaneous sharks | 2.95 |

[a] Target tuna consists of *Thunnus alalunga*, *Thunnus obesus*, and *Thunnus albacares*.

Finally, there has been one documented case of illegal fishing by a foreign vessel in the Kermadec Islands' EEZ. In late 2009, a Vanuatu flagged longline vessel (Taiwanese owned), as well as a Taiwanese flagged longline vessel, were spotted (12 miles apart) on the same day, just north of the Kermadec Islands.[6] The owners of these vessels have acknowledged that they were fishing illegally and have both paid fines to the New Zealand Government. Although this is the only documented case of illegal fishing, it is assumed that other instances of illegal fishing have also taken place within the Kermadec EEZ, due to the remoteness of the area. However, without further evidence we cannot estimate the impact that illegal fishing has on the marine resources within the Kermadec Islands' EEZ.

## Results

The total domestic catch for Kermadec, for the time period of 1950-2010, was 971 t (Figure 2). This catch only spans the time period of 1990-2010 as there was no domestic fishing in the Kermadec EEZ prior to this time period. The average annual catch over the 1990-2010 time period equalled approximately 46 t·year$^{-1}$. The species composition for the domestic catch was extremely diverse. The data obtained from the Ministry of Fisheries contained 100 taxonomic groups, with only a few miscellaneous categories. Out of this large mix of species, it was seen that the domestic catch was dominated by swordfish (*Xiphias gladius*) which represented 26.9% of the total catch (261 t). Bass (*Polyprion americanus*), bigeye tuna (*Thunnus obesus*), and bluenose (*Hyperoglyphe antarctica*) were the other major species present in the catch, with approximately 95 t (9.8%), 91 t (9.4%), and 85 t (8.7%), respectively, of the total

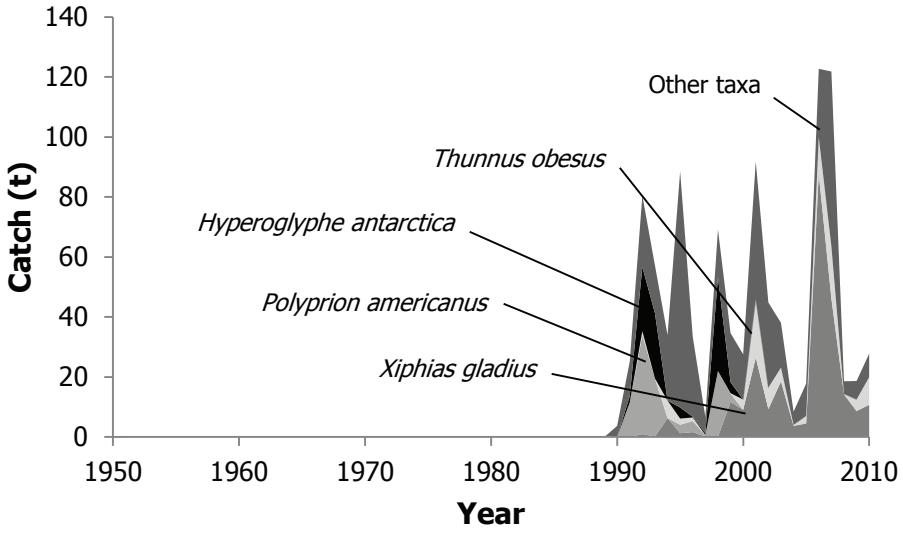


**Figure 2.** Domestic fisheries catch in the Kermadec Islands EEZ, separated by species. The grouping "other taxa" contains 98 taxonomic groups, and includes both marine fish and invertebrates.

[6] http://www.fish.govt.nz/en-nz/Press/Press+Releases+2010/November10/Foreign+vessel+admits+fishing+illegally+in+New+Zealand+waters.htm [accessed April 13, 2012]

domestic catch (Figure 2). There was a small amount of discarded shark (Selachimorpha) calculated from the shark fin catch, totalling 22 t over the time period and representing 2.3% of the total domestic catch.

The total foreign catch for 1950-2010 is estimated at 14,475 t (Figure 3). The average annual catches peaked in the 1980s with approximately 580 t·year$^{-1}$ and have declined dramatically since. From the information available, it is assumed that only Japanese and South Korean vessels were fishing in the Kermadec EEZ. South Korean vessels represented approximately 80% (11,600 t) of the total foreign catch, with Japanese vessels catching the remaining 20% (2,900 t; Figure 3a). Within the Kermadec EEZ, foreign vessels were mainly targeting tuna and billfish. The overall foreign catch was dominated by albacore with 45.4% (6,576 t) of the catch. Other major species included bigeye tuna, swordfish, shortfin mako shark, and yellowfin tuna, with 2,657 t (18.4%), 1,113 t (7.7%), 909 t (6.3%), and 810 t (5.6%), respectively, of the total foreign catch (Figure 3b). In terms of individual fleets, the only major difference was that South Korea's major species was albacore with 53% (6,149 t) of the total catch, whereas Japan's largest contributor was bigeye tuna with 47% (1,369 t) of the total catch.

Overall, foreign catches far outweighed domestic catches (Figure 4).

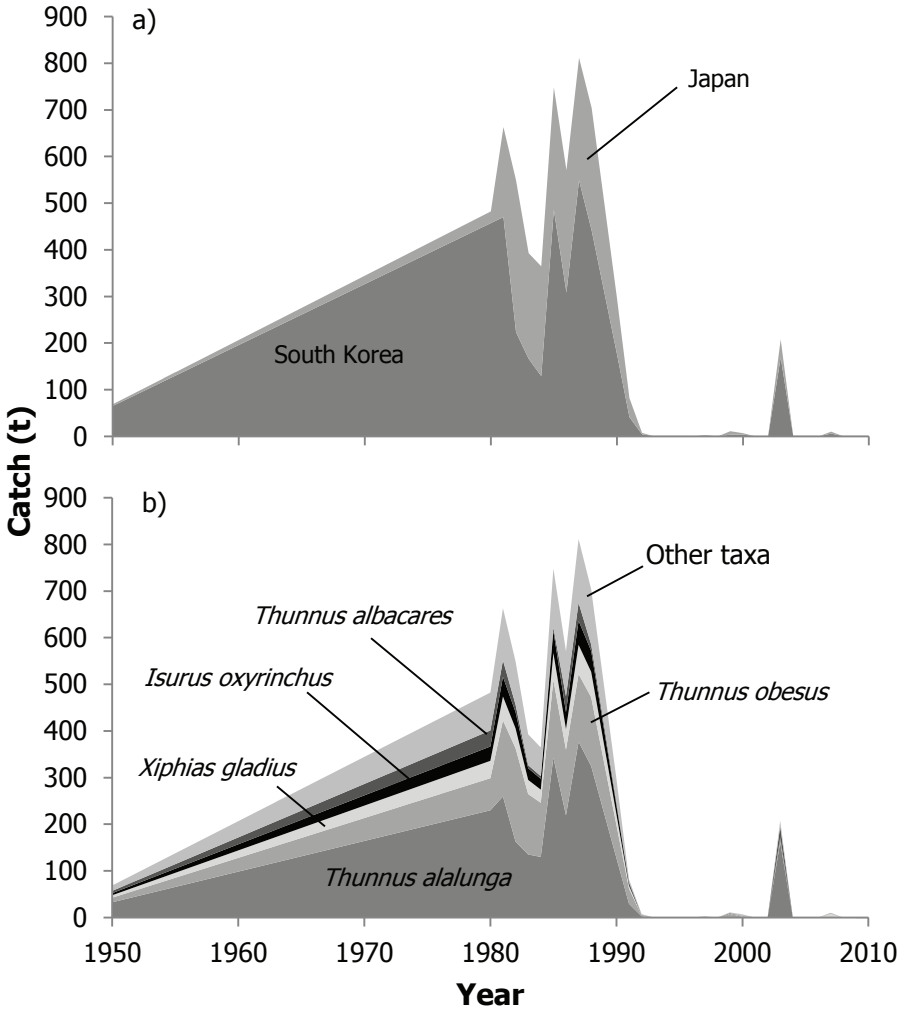


**Figure 3.** Total estimated foreign catch for the Kermadec Islands' EEZ, 1950-2010, (a) divided by country; and (b) by species. The grouping "other taxa" contains 24 taxonomic groups, including both marine fish and invertebrates.

## Discussion

The total reconstructed domestic catch for the Kermadec Islands equalled 971 t, with an additional 14,475 t of foreign vessel catch, for the time period of 1950-2010. Catch data from 1990 onward was provided by the New Zealand Ministry of Fisheries upon request. It should be noted that there appears to be some discrepancy in the Ministry of Fisheries reporting. There is catch data, by region, for the last six years available on the Ministry of Fisheries website. For Kermadec (FMA10), the website reports that there is no customary or recreational fishing as the islands are uninhabited, and also states that the Kermadecs are not open to commercial fishing, except for research purposes. The website reports only 52 kg of commercial catch in 2007 and zero catch in 2008-2010.[7] This is not the same

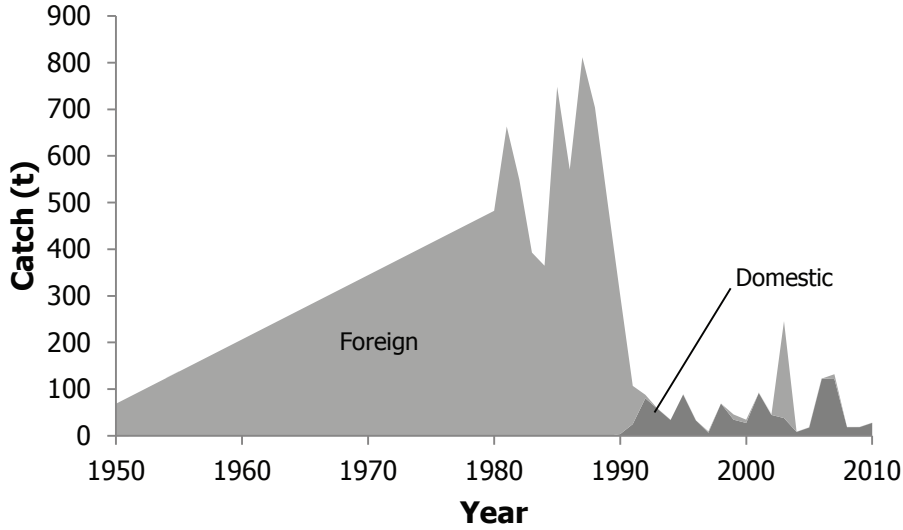


**Figure 4.** Total estimated catch within the waters of the Kermadec Islands' EEZ, divided by foreign and domestic (New Zealand) catch, 1950-2010.

[7] http://fs.fish.govt.nz/Page.aspx?pk=41&tk=99&ey=2007, accessed February 3, 2012

as the data which were provided by the Ministry of Fisheries upon request, which stated that the domestic catch for 2007 was 122 t. Catches provided by the Ministry of Fisheries for the years 2008-2010 averaged 22 t·year$^{-1}$ which does not equal the zero reported catch value on the Ministry's website either. Currently, only the 12-mile territorial seas around Kermadec are protected/designated as marine reserves. The Kermadec EEZ is named as a Benthic Protection Area which protects the area from bottom trawling. This makes it illegal to trawl within 100 meters of the bottom. With these protection measures in mind, as well as the consideration by conservation organizations to create an ocean sanctuary around the Kermadecs, accurate and transparent reporting of fishing activities in the region is crucial. Consistent and effective patrols are also required to deter and capture illegal fishing vessels which threaten the area.

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**Appendix Table A1.** Total reconstructed catch (t) for the Kermadec Islands, 1950-2010, by fishing country (domestic vs. foreign catches).

| Year | Reconstructed domestic catch | Reconstructed foreign catch | |
|---|---|---|---|
| | New Zealand | Japan | South Korea |
| 1950 | - | 3.6 | 65.3 |
| 1951 | - | 4.3 | 78.4 |
| 1952 | - | 5.0 | 91.4 |
| 1953 | - | 5.7 | 104.5 |
| 1954 | - | 6.5 | 117.6 |
| 1955 | - | 7.2 | 130.6 |
| 1956 | - | 7.9 | 143.7 |
| 1957 | - | 8.6 | 156.8 |
| 1958 | - | 9.3 | 169.8 |
| 1959 | - | 10.0 | 182.9 |
| 1960 | - | 10.8 | 196.0 |
| 1961 | - | 11.5 | 209.0 |
| 1962 | - | 12.2 | 222.1 |
| 1963 | - | 12.9 | 235.1 |
| 1964 | - | 13.6 | 248.2 |
| 1965 | - | 14.3 | 261.3 |
| 1966 | - | 15.1 | 274.3 |
| 1967 | - | 15.8 | 287.4 |
| 1968 | - | 16.5 | 300.5 |
| 1969 | - | 17.2 | 313.5 |
| 1970 | - | 17.9 | 326.6 |
| 1971 | - | 18.6 | 339.6 |
| 1972 | - | 19.4 | 352.7 |
| 1973 | - | 20.1 | 365.8 |
| 1974 | - | 20.8 | 378.8 |
| 1975 | - | 21.5 | 391.9 |
| 1976 | - | 22.2 | 405.0 |
| 1977 | - | 22.9 | 418.0 |
| 1978 | - | 23.7 | 431.1 |
| 1979 | - | 24.4 | 444.2 |
| 1980 | - | 25.1 | 457.2 |
| 1981 | - | 192.8 | 470.3 |
| 1982 | - | 325.6 | 223.3 |
| 1983 | - | 226.4 | 166.4 |
| 1984 | - | 235.3 | 129.3 |
| 1985 | - | 262.5 | 485.8 |
| 1986 | - | 262.5 | 308.2 |
| 1987 | - | 262.5 | 549.0 |
| 1988 | - | 262.5 | 441.4 |
| 1989 | - | 191.5 | 309.5 |
| 1990 | 3.7 | 120.6 | 177.6 |
| 1991 | 25.1 | 40.9 | 41.1 |
| 1992 | 80.4 | 3.1 | 4.5 |
| 1993 | 57.2 | - | - |
| 1994 | 33.9 | - | - |
| 1995 | 88.6 | - | - |
| 1996 | 33.4 | - | - |
| 1997 | 6.7 | 1.2 | 1.7 |
| 1998 | 69.2 | - | - |
| 1999 | 34.6 | 7.5 | 3.7 |
| 2000 | 27.6 | 3.0 | 4.0 |
| 2001 | 91.9 | - | - |
| 2002 | 44.8 | - | - |
| 2003 | 38.1 | 38.6 | 169.2 |
| 2004 | 8.4 | - | - |
| 2005 | 17.8 | - | - |
| 2006 | 122.7 | - | - |
| 2007 | 121.9 | 4.2 | 6.0 |
| 2008 | 18.6 | - | - |
| 2009 | 18.6 | - | - |
| 2010 | 27.8 | - | - |

**Appendix Table A2.** Total reconstructed domestic catches (t) for the Kermadec Islands, 1950-2010, by taxonomic category.

| Year | *Xiphias gladius* | *Polyprion americanus* | *Thunnus obesus* | *Hyperoglyphe antarctica* | Other taxa[1] |
|---|---|---|---|---|---|
| 1950 | - | - | - | - | - |
| 1951 | - | - | - | - | - |
| 1952 | - | - | - | - | - |
| 1953 | - | - | - | - | - |
| 1954 | - | - | - | - | - |
| 1955 | - | - | - | - | - |
| 1956 | - | - | - | - | - |
| 1957 | - | - | - | - | - |
| 1958 | - | - | - | - | - |
| 1959 | - | - | - | - | - |
| 1960 | - | - | - | - | - |
| 1961 | - | - | - | - | - |
| 1962 | - | - | - | - | - |
| 1963 | - | - | - | - | - |
| 1964 | - | - | - | - | - |
| 1965 | - | - | - | - | - |
| 1966 | - | - | - | - | - |
| 1967 | - | - | - | - | - |
| 1968 | - | - | - | - | - |
| 1969 | - | - | - | - | - |
| 1970 | - | - | - | - | - |
| 1971 | - | - | - | - | - |
| 1972 | - | - | - | - | - |
| 1973 | - | - | - | - | - |
| 1974 | - | - | - | - | - |
| 1975 | - | - | - | - | - |
| 1976 | - | - | - | - | - |
| 1977 | - | - | - | - | - |
| 1978 | - | - | - | - | - |
| 1979 | - | - | - | - | - |
| 1980 | - | - | - | - | - |
| 1981 | - | - | - | - | - |
| 1982 | - | - | - | - | - |
| 1983 | - | - | - | - | - |
| 1984 | - | - | - | - | - |
| 1985 | - | - | - | - | - |
| 1986 | - | - | - | - | - |
| 1987 | - | - | - | - | - |
| 1988 | - | - | - | - | - |
| 1989 | - | - | - | - | - |
| 1990 | - | - | - | 0.005 | 3.7 |
| 1991 | 0.03 | 11.447 | 0.008 | 2.068 | 11.5 |
| 1992 | 0.93 | 33.026 | 1.300 | 21.414 | 23.8 |
| 1993 | 0.10 | 19.358 | 0.035 | 21.789 | 15.9 |
| 1994 | 6.29 | - | 5.812 | - | 21.8 |
| 1995 | 1.24 | 2.819 | 2.051 | 3.706 | 78.7 |
| 1996 | 1.61 | 3.677 | 1.198 | 0.235 | 26.7 |
| 1997 | 0.10 | 0.430 | 0.110 | 0.610 | 5.5 |
| 1998 | 0.06 | 21.854 | 0.050 | 31.280 | 15.9 |
| 1999 | 11.68 | 2.772 | 0.130 | 3.654 | 16.4 |
| 2000 | 9.05 | - | 3.416 | - | 15.1 |
| 2001 | 26.42 | 0.002 | 19.532 | - | 45.9 |
| 2002 | 9.28 | - | 7.141 | - | 28.4 |
| 2003 | 18.50 | - | 4.581 | 0.035 | 14.9 |
| 2004 | 3.69 | - | 0.350 | - | 4.4 |
| 2005 | 4.48 | - | 2.600 | - | 10.7 |
| 2006 | 87.69 | - | 12.277 | 0.010 | 22.7 |
| 2007 | 46.15 | 0.012 | 17.364 | 0.030 | 58.3 |
| 2008 | 14.22 | - | 0.134 | - | 4.2 |
| 2009 | 8.63 | - | 3.863 | - | 6.2 |
| 2010 | 10.69 | 0.078 | 9.145 | 0.070 | 7.8 |

[1] Other taxa category includes 97 additional taxonomic groups.