RECONSTRUCTION OF SRI LANKA'S FISHERIES CATCHES: 1950-2008[1]

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ABSTRACT

Sri Lanka has a long history of reliance on the sea for the nutritional and economic well-being of its people. Fishing has long been an important industry and, while detailed fishing records exist dating back to the early 1900s, they are incomplete. In this study, we estimated total marine fisheries catches for the 1950-2008 time period by accounting for all fisheries sub-sectors and components and compared this to the reported landings as provided to FAO. Our total reconstructed catch which included commercial and subsistence catches, and discarded bycatch was estimated at almost 18 million tonnes over the 1950-2008 time period. This estimate was over 2 times larger than the total landings reported by Sri Lanka to the FAO. The majority of this discrepancy was due to catches from the subsistence sector and discarded bycatch associated with shrimp trawl fisheries. Improved monitoring of, and record-keeping for, these fisheries components is crucial to the longterm management of Sri Lanka's fisheries and to maintaining livelihoods and food security of the Sri Lankan people.

INTRODUCTION

The Democratic Socialist Republic of Sri Lanka is an island country southeast of India within the Bay of Bengal (Figure 1). The climate is tropical with seasonal monsoon and cyclones, but no upwelling. In 2009, the population was 20 million (Anon, 2009) with 32 percent living in coastal areas (UNEP, 2001). The Sri Lankan Exclusivity Economic Zone (EEZ) lies within FAO statistical area 57 (FAO, 2011).

The island was colonized by the Portuguese and the Dutch, but most influentially by the British. Sri Lanka, or "Ceylon" as it was known prior to 1972, was a strategic military and trade link between West Asia and Southeast Asia. It acquired independence from the British Empire as the Dominion of Ceylon in 1948, just after World War II. In 1972, Ceylon became a republic and the name was changed back to the pre-colonial name: Sri Lanka (De Silva, 1981).

Attempts to record fisheries data in Sri Lanka may have begun during British rule; however, a rigorous island-wide attempt to estimate total landings did not start until after independence. Since 1910, general fisheries information was recorded by the resident marine biologist as part of an annual fisheries administration report. These reports included descriptions of traditional fisheries, destructive practices, fisheries regulations, results of test fisheries, policy changes, and financial record keeping; yet, information regarding landings on the island was incomplete (Pearson, 1911; 1922). By the 1930s, the importance of quantifying total landings was recognized, and by the 1940s, efforts to quantify landings were well underway with the appointment of 12 fisheries inspectors (FIs) within 20 fisheries districts. In the early 1950s, the number of FIs was increased to 24. The first comprehensive annual report of total landings was published in 1952 by the Department of Fisheries (DOF); the reports were, from then on, published annually (reviewed in Sivasubramaniam, 1997).

Records of landings in the 1950s focused mainly on the traditional practice of beach seining as it accounted for approximately 40% of total landings (Canagaratnam and Medcof, 1956). The use of the large beach seine, *madella*, began in the mid to late 1800s and continued to be the most commonly used traditional fishing techniques throughout the twentieth century (Alexander, 1977). Gillnetting began in the 1950s, and eventually took over as the most widespread fishing method for small-scale fishers. Incidents of

[1] Cite as: O'Meara, D., Harper, S., Perera, N. and Zeller, D. (2011) Reconstruction of Sri Lanka's fisheries catches: 1950-2008. pp. 85-96. *In*: Harper, S. and Zeller, D. (eds.) Fisheries catch reconstructions: Islands, Part II. Fisheries Centre Research Reports 19(4). Fisheries Centre, University of British Columbia [ISSN 1198-6727].

illegal dynamite fishing and fish poisoning were also reported. The DOF showed great interest at this time in test fisheries, with special attention to experimental dredging for pearl and windowpane oysters, as well as trawler surveys (Sivalingam, 1961).

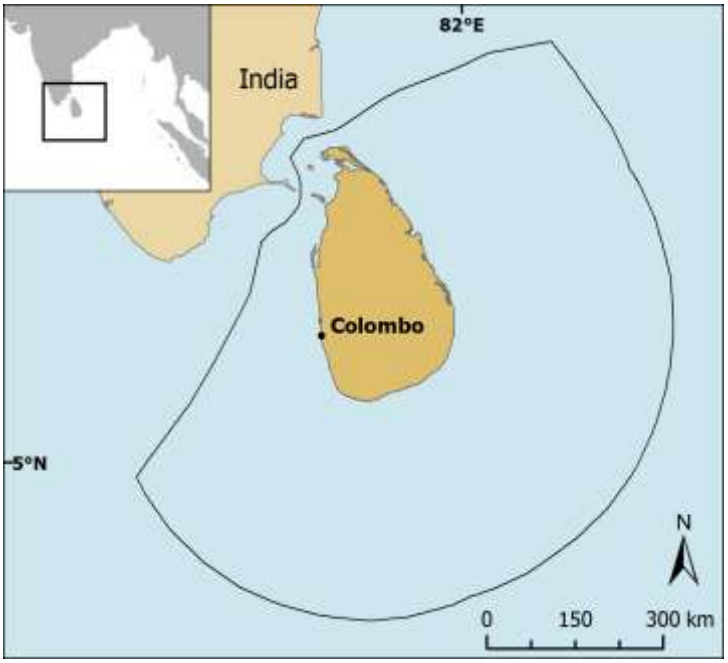

Figure 1. Map of Sri Lanka and ts Exclusive Economic Zone.

Artisanal and traditional fisheries in the 1950s could not meet the island's domestic demand for marine fish. Thus, markets were supplemented with cheap imports of predominantly dried fish products from Pakistan, Japan, and India. Sri Lanka was not a large exporter of marine fish with the exception of a small market in Thailand and Singapore for shark fins, sea cucumbers and ornamental shells called 'chanks' (*Turbinella pyrum*). Domestic marine fish production and export capacity were limited by poor infrastructure, most importantly the lack of ice and salt at landing sites, and inefficiencies attributed to the traditional nature of the fishery. In an attempt to improve upon traditional methods, the DOF imported nylon nets and implemented the development of a craft motorization program (Canagaratnam and Medcof, 1956). Subsidies for 11,000 outboard motors and the introduction of 17-23 foot fibre-reinforced plastic (FRP) boats were credited for the subsequent high annual growth rate of Sri Lanka's fisheries that lasted until the beginning of civil war in 1983 (RAPA, 1989). In the last few decades, there has been an effort to augment pelagic fisheries though government assistance to increase the number of multiday vessels capable of fishing offshore and in international waters.

With the aid of the FAO, statistical methods again improved in the 1970s with the removal of the position of statistical officer and the appointment of an additional 143 FIs, while a new sampling system was also adopted that utilized landing centers as primary sampling units, and boats as secondary sampling units. In 1981, the National Aquatic Resources Research and Development Agency (NARA) was established with the mandate to improve research and development, with an emphasis to better understand tuna biology and catch statistics by way of a collaborative effort with the Indo-Pacific Tuna Programme (IPTP), the Bay of Bengal Programme (BOBP), the Food and Agriculture Organization (FAO) and the Asian Development Bank (ADB) (Dayaratne and Maldeniya, 1996). Gillnetting, a practice that had become popular in the 1960s, continued as a favorite of Sri Lankan fishers and by the 1970s, was accountable for 60% of reported fisheries catches.

Shortly after the establishment of NARA, civil war broke out between the Liberation Tigers of Tamil Eelam (LITE) and the Government of Sri Lanka (GoSL). The effect of the war on fisheries was considerable, especially in the north where restrictions (e.g., a ban on outboard motors greater than 40 hp, Maldeniya, 1997b) on fishers were put in place to prevent fuel and weapons from being illegally brought from India by the LITE. Additionally, the conflict led to the destruction of boats, gear, and infrastructure which included ice making facilities and highways important for fish transport to distant markets (Silucaithsam and Stokke, 2006). The northern fishing grounds, once responsible for producing over 40% of the country's reported landings, were the most productive and accessible fishing grounds in Sri Lanka due to the presence of a large continental shelf and a trawlable bottom (Engvall *et al.*, 1977).

The 1990s saw an increase in reported landings due to improvements in the security situation in some areas of the north and the expansion of the fishing fleet offshore and internationally. By the 1990s, government officials recognized coastal resources were fully exploited, and efforts were shifted to expanding the potential of deep sea fisheries by providing boat and equipment subsidies (Mallikage,

2001). For billfish, this was attributed to improvements in gear and the expansion of fisheries into offshore and deep sea areas (Maldeniya *et al.*, 1996).

Methods for improvement of catch statistics have been made in the 2000s, but overall, they remained the same since the changes made in 1981. The demand for marine fish has remained high, with a catch that was insufficient to meet demand. Despite the increase in multiday fishing vessels and other larger craft a large component of the marine fishing fleet continues to consist of small FRP boats with outboard motors as well as non-motorized traditional craft (FAO, 2006). The tsunami in December 2004 seriously affected 90% of the fishing community through losses of boats, fishing nets, housing, and lives. Eighty percent of fishing villages were completely destroyed, along with 12-14 fishing harbors (ITDG, 2005). Post-tsunami efforts to rebuild fisheries have resulted in an overabundance of fishing boats in some areas raising concerns for overfishing (Jayasuriya *et al.*, 2005).

With the end of the civil war in 2010, efforts to increase fisheries production in the north were a high priority for the DOF. Growing domestic demand for seafood and the potential for substantial earnings from seafood exports appear to be the driving force behind current fisheries policy, with plans to double marine fisheries production in the future. Apart from increasing landings, offshore fisheries have been identified as a more viable source of high value export oriented species such as tuna. The lack of adequate offshore fishing capacity has been seen as a major obstacle to fisheries expansion, and there have been initiatives to allow commercial fishing by foreign vessels in exchange for access fees and prescribed landings in order to increase domestic fish supply (Anon., 2010).

Small-scale subsistence fisheries are often not considered when collecting fisheries statistics; however, they can constitute a large portion of actual catches (Zeller *et al.*, 2007). The goal of this study was to more accurately quantify total marine fisheries catches, by taking into account all fisheries sub-sectors and components, including subsistence catch and discarded bycatch. The importance of fisheries to the livelihoods of Sri Lankan's, particularly coastal dwellers, requires a more comprehensive estimate and accounting of the true magnitude of fisheries extractions.

METHODS

Total marine fisheries catches were estimated using information obtained from national reports, independent studies, local experts and grey literature. Landings data presented by the FAO on behalf of Sri Lanka were compared to national landings data, and household surveys were used to estimate total demand for domestic seafood as compared to local supply. We also estimated discarded bycatch for the shrimp trawl and tuna longline fisheries. In this report we refer to 'landings' as the amount of fish caught, brought to shore and recorded, while 'catch' refers to the total amount of fish caught, and includes Illegal, Unreported and Unregulated (IUU) catches and discarded bycatch.

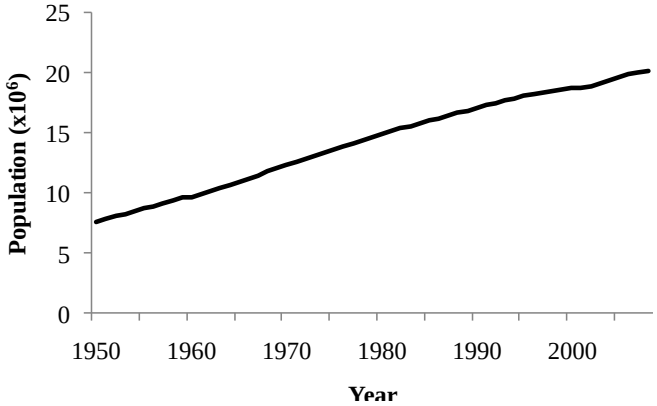

Figure 2: Human population trend for Sri Lanka. Data source: www.populstat.info and World Bank (Anon, 2009).

Population

Human population data were obtained for the 1950-1959 period from Populstat (www.populstat.info) and for the 1960-2008 time period from the World Bank (Anon, 2009). Population estimates were used to derive *per capita* marine supply and subsistence catch rates. The population of Sri Lanka has increased steadily from 7 million in 1950 to over 20 million in 2008 (Figure 2).

Commercial fisheries

Total commercial landings for Sri Lanka were available in nationally published reports as well as by the FAO; however, the national data contained a statistical error causing landings to be high for years prior to 1970 (Pathirana, 1972); landings reported to FAO and obtained from FAO FishStat were lower than nationally reported landings prior to 1970 (Figure 3). Therefore, it was assumed that the statistical error in the national data was accounted for and corrected in landings presented in FAO's FishStat. Landings presented by the FAO were also more complete from 1980-1990, where national landings data were sparse. FAO data for crustaceans were compared to prawn and lobster landings presented by NARA. For the 1994-2002 time period, prawn and lobster landings were used in place of the FAO's 'miscellaneous marine crustaceans' grouping, as they were deemed to be a better representation of total crustacean catches (Figure 5). Marine crab fisheries, although known to occur in Sri Lanka, were assumed to be contained within a new, but smaller miscellaneous crustaceans category as no data was available to determine catch. With the exception of the amendment to crustaceans landings, the remainder of the FAO data was considered a good representation of commercial fisheries landings, both for the artisanal and industrial sectors. These landings were used as a baseline, to which we added components not accounted for in the officially reported data. Noteworthy are two non-fishery related events which are correlated with a noticeable decrease in landings over the time period considered; the beginning of the civil war in 1983 and the tsunami which occurred on December 26th, 2004.

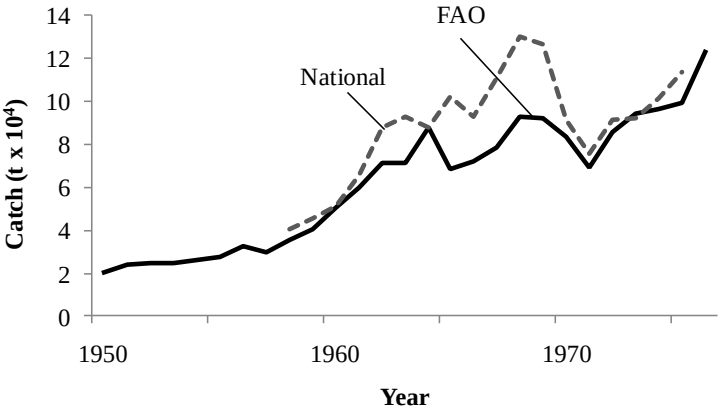

Figure 3: Comparison of landings data as presented by FAO and the national data source, indicating the statistical error in the national data, and its correction in data presented by FAO on behalf of Sri Lanka.

Discards

Shrimp trawl fisheries are typically associated with considerable bycatch, which can either be landed or discarded at sea. A study in the late 1970s estimated bycatch associated with the shrimp fishery in two of Sri Lanka's main shrimp trawling grounds, Jaffna and Mannar (Subasinghe, 1981). The study provided estimates for both the landed and discarded components of the bycatch. Subasinghe (1981) presents discard rates for both areas, which gave an average rate of 10.2 kg of discards per kg of shrimp landed for 1979 (Discard rates for Mannar and Jaffina were 8.92 and 11.48 kg discarded per kg landed, respectively). These two regions were responsible for 60% of the commercial production of shrimp that year (Subasinghe, 1981; Saila, 1983). Therefore, we assumed that this discard rate was representative of Sri Lanka's shrimp trawl fisheries and applied the rate of 10.2 kg discards per kg of shrimp landed across the entire time period. Discards may have been even higher in earlier time periods due to greater benthic biomass and/or less storage capacity on vessels for non-target species; however, to remain conservative we held the discard rate constant back in time to 1950. For the recent time period, we carried the 1979 discard rate forward, unaltered, to 2008. This same study reported that over 80% of the discarded catch was silverbellies (Leiognathidae); we considered the remainder to be miscellaneous small pelagic fishes and miscellaneous sharks.

Table 1. Estimated seafood consumption rates derived from the Department of Census and Statistics 2007 Household Income and Expenditure Survey.

Year	*Per capita* demand ($kg \cdot person^{-1} \cdot year^{-1}$)
1981	19.39
1986	18.24
1991	14.64
2002	19.86
2005	24.12
2007	24.12

Depending on the type of gear used, bycatch is also of concern for tuna fisheries. The majority of tuna catches in Sri Lanka are skipjack tuna (*Katsuwonus pelamis*), representing roughly 60% of tuna catches and yellowfin tuna (*Thunnus albacares*), representing approximately 20% of the tuna catches. Tuna are predominantly caught using gillnets, although, longlines are becoming increasingly popular for catches

aimed at the export market (Maldeniya, 1997b). Kelleher (2005) estimates discards by tuna longline in Sri Lankan waters to be 0.05%. Given that this was a very low discard rate, and given that we were unable to determine the portion of the tuna catch taken by longline, we did not estimate this component of the bycatch. As for bycatch associated with the tuna gillnet fisheries, information was also quite sparse. Due to the size of the nets used, incidental catch in the tuna gillnet fishery is mainly seerfish, billfish and shark. Given that these are marketable species, we assumed that the majority of the non-targeted catch for the tuna gillnet fishery was retained and that this portion of the catch was accounted for in the landings data.

Subsistence fisheries

We assumed that the subsistence component of small-scale fisheries was unaccounted for in the reported data. To estimate this component of the total catch, we calculated the island-wide marine seafood demand using *per capita* consumption data from the 2007 Department of Census and Statistics Household Income and Expenditure Survey (Anon, 2007); and compared this to the reported (commercial) landings presented by the FAO. We considered the difference between the supply of marine products for human consumption and the demand for seafood to be the subsistence catch.

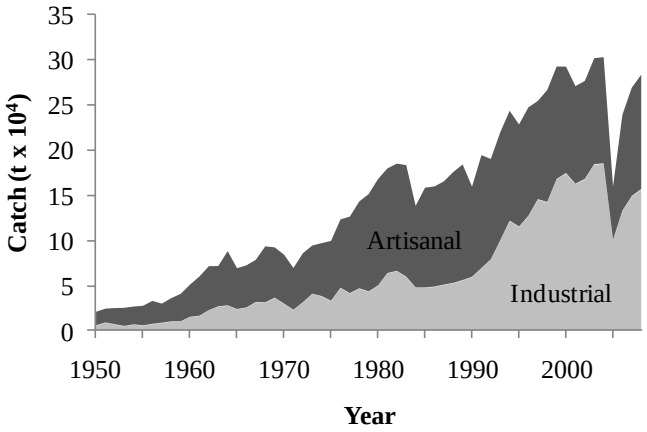

Figure 4: Total commercial fisheries catches for Sri Lanka, separated by industrial and artisanal fisheries, 1950-2008.

The supply of marine products available for consumption by the local population was estimated as the commercial landings (FAO data) adjusted for imports and exports (W. Swartz, unpublished data, UBC Fisheries Centre). These adjusted landings were then converted to *per capita* supply rates using human population data.

To estimate marine demand, the *per capita* marine fish consumption was obtained from the 2007 Sri Lanka Department of Census and Statistics Household Income and Expenditure Survey (HIES). A detailed breakdown of *per capita* consumption of marine products was available for 2007 only. The *per capita* consumption of fish, which included aquaculture and freshwater products, was summarized in the 2007 survey for the years: 1981, 1986, 1991, 2002, and 2005. In order to remove aquaculture and freshwater consumption and calculate marine consumption, we assumed that the ratio of freshwater and aquaculture consumption to marine fish consumption remained the same over the entire survey period. This assumption resulted in a conservative estimate of *per capita* marine consumption as aquaculture and freshwater fish consumption have likely increased since the 1980s. However, in order to remain conservative, the amounts removed were assumed to be proportional to those in 2007. Conversion factors provided by the FAO for Indonesia (FAO, 2000) were used to convert product weight from the 2007 HIES into live weight. The resulting *per capita* seafood consumption rates for 1981, 1986 and 2007 were used as anchor points to derive a complete time series of consumption rates for the 1950-2008 study period (Table 1). We did not use the 1991 and 2002 estimates of *per capita* consumption since these points exactly matched FAO reported landings when they were multiplied by the human population. These points were likely estimates of *per caput* consumption (reported landings divided by the population) and hence left out

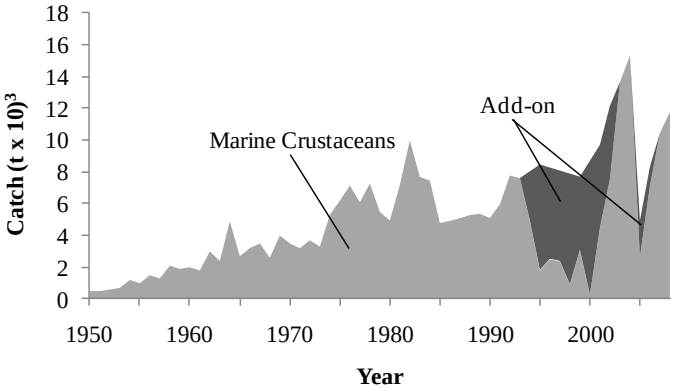

Figure 5: Reported landings of marine crustaceans (light colour) and the additional estimated catches during the 1990s and early 2000s.

of the analysis. We assumed that the consumption rate in 1950 was the same as that in the 1980s, and therefore carried the 1981 rate of 19.39 kg·person^{-1}·year^{-1} back, unaltered to 1950. The 2007 estimate was carried forward to 2008. Years between anchor points were interpolated linearly. Finally, we subtracted the *per capita* marine supply (FAO landings adjusted for imports and exports) from the total *per capita* seafood demand to determine the *per capita* subsistence catch rate. Human population data were then used to convert *per capita* subsistence catch rates into total subsistence catch amounts. This calculation was not done for 2005 since, although the 2005 consumption estimate was thought to be reasonable, the reported landings were low due to the tsunami, which was likely the result of both fewer catches and poor reporting. The subsistence catch rate for the year following the tsunami (2005) was estimated by linear interpolation between the 2004 and 2006 subsistence catch rates and then was reduced by the same percent decline in catch (42%) as reported by the FAO for landings between the years 2004 and 2005. It is possible that subsistence was underestimated for anchor points following the beginning of civil conflict in 1983 as it is unlikely surveys included regions at war. The 2007 HIES states that Trincomalee and the Northern Province, known for high marine productivity and possibly higher *per capita* consumption, were not sampled in 2007 due to active conflict in these areas; consequently, it is likely the *per capita* consumption and hence the subsistence catch estimates are conservative.

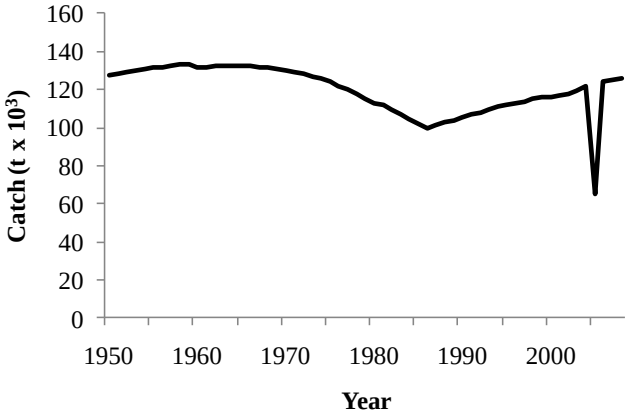

Figure 6: Reconstructed total subsistence catches for Sri Lanka, 1950-2008.

Subsistence catches were assumed to be composed of small pelagic species (50%), demersal species (40%) and invertebrates such as crabs and cephalopods (10%). The small pelagic species caught were mainly clupeids and scombrids, with the most common species being *Sardinella gibbosa*, *S. albella, Amblygaster sirm, A. clupeoides, Rastrelliger kanagurta,* and *Auxis thazard*. Demersal species catches were mainly represented by Lethrinidae, Carangidae, Myliobatidae, Sciaenidae, Haemulidae, Leognathidae, and Acanthuridae (Canagaratnam and Medcof, 1956; Maldeniya, 1997a; MFAR, 2008). Industrial and artisanal catches were also improved for FAO "crustaceans nei" utilizing assumptions based on Jayawardane *et al.* (2003). The species breakdowns for lobster and sea cucumbers were also improved based on local expert opinion (N. Perera, pers. obs., Linnaeus University)

Other IUU components

While catches of sea cucumbers and sharks are reported in the official landings data, they are likely under-estimates. Unreported catches of sea cucumbers and sharks are common in Sri Lankan waters; however, data on these were not readily available. Although we were unable to account for this unreported component as part of the reconstructed catch, it should be noted that IUU fishing is known to occur in Sri Lanka and should be further investigated (P. Ganapathiraju, pers. comm., UBC Fisheries Centre).

RESULTS

Commercial fisheries

Total marine fisheries catches by the commercial sector (artisanal and industrial) were estimated to be 8.4 million tonnes over the 1950-2007 time period (Figure 4). Catches in 1950 were approximately 20,000 t·year^{-1} and increased steadily to over 300,000 t·year^{-1} in 2004. This was followed by a substantial decrease in catches to around 15,000 tonnes in 2005, the year after the tsunami devastated Sri Lanka. Total commercial catches were composed of small- (artisanal) and large-scale (industrial) sectors, which represented 55% and 44%, respectively of the total commercial catch. The total commercial catch included over 50,000 tonnes of additional crustaceans, which were not represented in the reported landings as presented by FAO (Figure 5). Catches of marine crustaceans were estimated to be 320,000 tonnes for the period 1950-2008. These were mainly shrimp (75%) and lobster (9%), with the remainder being

miscellaneous marine crustaceans. Discards associated with the shrimp trawl fishery were estimated over the study period to be approximately 2.4 million tonnes (Figure 8).

Subsistence Fisheries

Total catches by the subsistence sector were estimated to be over 7 million tonnes from 1950-2008 (Figure 6). Subsistence catches remained relatively stable over the entire study period with an average annual catch of around 120,000 t·year^{-1} (Figure 8). A decrease in subsistence catches was observed for the late 1970s and early 1980s, but they increased again after that.

Total reconstructed catch

The total reconstructed catch of marine fisheries in Sri Lanka was estimated to be almost 18 million tonnes over the 1950-2008 time period (Figure 7). This estimate of total catches was 2.13 times larger than the landings officially reported by Sri Lanka to the FAO. Reported landings, as presented by the FAO on behalf of Sri Lanka were 8.4 million tonnes. The subsistence catch represented 40% and discards represented 13% of the total estimated catch (Figure 8). The remainder of the total catch was from the artisanal (26%) and industrial (21%) sub-sectors of commercial fisheries. The estimate for commercial catch was almost entirely based on reported landings, while the subsistence and discards were entirely unreported components. Major contributing taxa in the reconstructed catch included silverbellies (Leiognathidae), skipjack tuna (*Katsuwonus pelamis*), herrings, sardines, and anchovies (Clupeoids), jacks (Carangidae), and yellowfin tuna (*Thunnus albacares*; Figure 9).

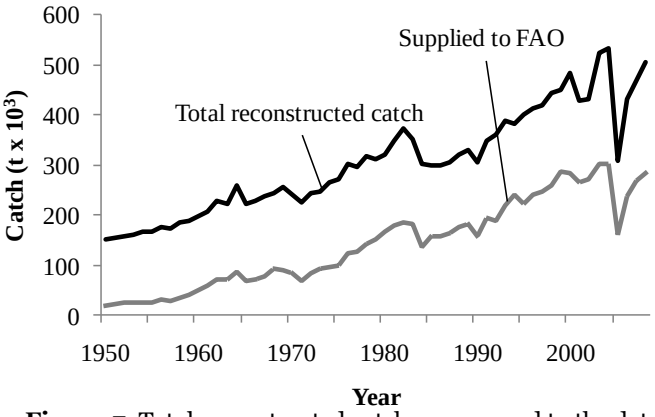

Figure 7: Total reconstructed catches compared to the data submitted by Sri Lanka to FAO, 1950-2008.

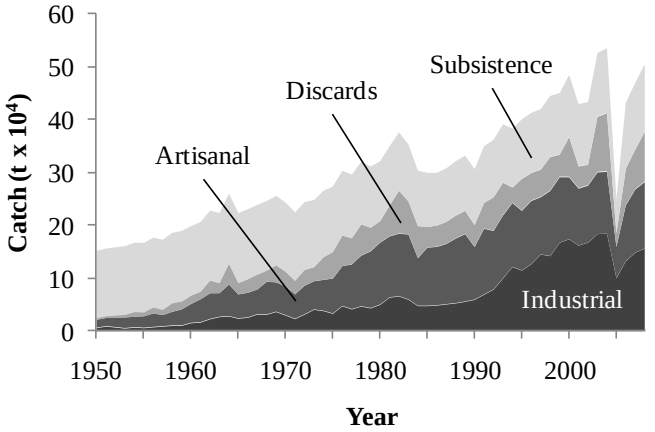

Figure 8: Total reconstructed catches for Sri Lanka by component or fisheries sector, 1950-2008.

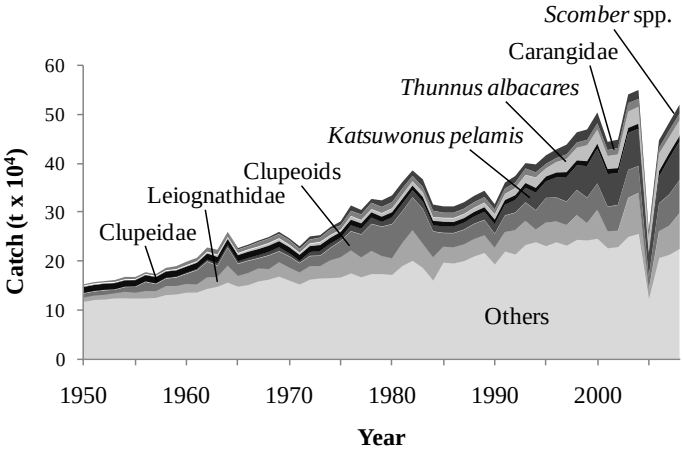

Figure 9: Total reconstructed catches with main taxa caught. All other taxa (88 total) were grouped into 'Others' category.

DISCUSSION

Total marine fisheries catches for Sri Lanka were estimated to be approximately 18 million tonnes over the 1950-2008 time period. This estimate was over 2 times larger than the landings reported by Sri Lanka to the FAO, which was approximately 8.4 million tonnes. This large discrepancy indicates a clear need for improvements in the collection and reporting of fisheries statistics in Sri Lanka. Our investigation into the fisheries of Sri Lanka revealed that information on subsistence fisheries, discarded bycatch and other IUU components was quite limited, even though these fisheries components contributed substantially to overall marine fisheries

catches. Subsistence fisheries catches were the largest unreported component of the catch, and represented 40% of the total reconstructed catch.

Discards from the shrimp trawl fishery were also a substantial contributor (13%) to the total catch, and was unaccounted for in the official data. The high rate of discarding in Sri Lankan shrimp trawl fisheries has been attributed to the limited cold storage facilities on multi-day boats. Economically important species are often stored while other less valuable species are discarded. However, the majority of the bycatch consists of low-valued species of Leiognathidae, which are typically discarded (Subasinghe, 1981). Tuna longline fisheries, on the other hand, have a much lower discard rate (0.05%) according to Kelleher (2005). This low rate of discarding is thought to be due to fishers targeting and landing multiple species of high economic importance, thus reducing the amount of discarded fish (Kelleher, 2005). Beach seining in the early period (1950s) was reported to have few discards, with the exception of jellyfish which were known to seasonally clog nets (Canagaratnam and Medcof, 1956).

The year following the tsunami, reported landings were significantly lower, even though seafood consumption remained constant. Although DOF offices were badly damaged by the tsunami and efforts were directed into emergency measures rather than accounting for landings, it is likely catches also decreased, especially in small-scale and subsistence fisheries as they sustained a large amount of damage. An assessment of the impacts of the tsunami on coastal fishers suggested that fishing pressure may have initially decreased in 2005, but then increased to pre-tsunami levels caused by excessive replacement gear and vessels donated to local fishers as part of the relief effort (De Silva and Yamao, 2007).

Illegal, unreported and unregulated fisheries are known to occur in Sri Lankan waters. For example, the transshipments of shark fins caught in Sri Lanka's EEZ occur regularly. Most Sri Lankan vessels lack adequate refrigeration capacity and will therefore trade sacks of shark fins to foreign vessels at sea, which allows them to empty their hold and continue fishing while at sea. Such catches are not included in any reporting mechanism. Sri Lankan vessels also participate in the poaching of sharks and sea cucumbers, which are caught illegally outside of Sri Lanka's EEZ in the poorly regulated waters of Somalia, Madagascar, and the Seychelles, and are then landed in Sri Lanka. These catches are reported as domestic landings, but this is not necessarily the case. A lack of enforcement and proper reporting has allowed these IUU fisheries to continue and possibly expand over time (P. Ganapathiraju, pers. comm., UBC Fisheries Centre). Additionally, foreign vessels, in particular Indian vessels, engage in illegal fishing within Sri Lanka's EEZ and these catches are not reported for Sri Lanka.

Previous attempts to estimate the potential sustainable yield in Sri Lankan waters suggested harvest rates of 250,000 t·year^{-1}, with around 80,000 t allocated to demersal species catches and 170,000 t for pelagic species (RAPA, 1989). Our reconstructed catches indicate that this level was likely surpassed as far back as 1974. In this study we highlighted the lack of proper accounting for total fisheries catches, which in the case of the subsistence sector accounted for almost half of the domestic marine food supply. Without a realistic estimate of what is being extracted, fisheries are likely to be mismanaged and possibly overexploited. Although human and financial resources may not be available to establish and maintain in depth monitoring programs, regular surveys conducted every few years have been found to be very effective in estimating subsistence and small-scale catch in other developing countries (Brouwer *et al.*, 1997; Zeller *et al.*, 2006).

ACKNOWLEDGMENTS

We thank the *Sea Around Us* Project, a collaboration between the University of British Columbia and the Pew Environment Group. The present work was funded by FAO through the Bay of Bengal Large Marine Ecosystem Project (www.boblme.org/). We thank Rudolf Hermes (FAO-BOBLME) for critical comments.

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Appendix Table 1. FAO reported landings vs. total reconstructed catch for Sri Lanka, 1950-2008, in metric tonnes.

Year	FAO landings (t)	Total reconstructed catch (t)
1950	20,622	151,813
1951	24,103	156,210
1952	24,709	158,421
1953	25,016	160,496
1954	26,433	166,998
1955	27,265	166,716
1956	32,702	176,616
1957	29,638	172,670
1958	35,737	185,640
1959	40,434	189,190
1960	50,775	198,438
1961	59,717	206,182
1962	71,137	227,544
1963	71,256	222,926
1964	87,796	259,676
1965	68,836	222,888
1966	72,083	230,049
1967	78,225	238,398
1968	93,080	245,640
1969	91,936	255,295
1970	83,855	242,466
1971	69,074	224,345
1972	85,438	243,631
1973	93,972	247,627
1974	96,608	264,940
1975	99,110	273,005
1976	122,870	302,695
1977	126,000	295,302
1978	142,768	319,436
1979	150,934	310,821
1980	167,594	320,543
1981	179,398	348,908
1982	184,664	374,713
1983	183,005	352,116
1984	137,909	302,847
1985	158,065	298,884
1986	159,437	298,798
1987	164,998	307,197
1988	175,347	320,621
1989	183,773	331,133
1990	159,173	305,788
1991	193,989	349,006
1992	189,939	360,916
1993	219,447	390,223
1994	240,307	381,993
1995	222,170	399,668
1996	242,031	411,686
1997	248,790	419,199
1998	259,746	443,709
1999	288,301	449,153
2000	284,314	483,307
2001	265,749	428,117
2002	271,927	432,235
2003	302,082	524,880
2004	303,168	533,482
2005	160,142	251,821
2006	239,292	432,512
2007	270,176	468,803
2008	285,028	503,501

Appendix Table 2. Total reconstructed catch (t) by major taxa for Sri Lanka, 1950-2008. Clupeoids include herrings, sardines, and anchovies. Others includes 86 taxa

Year	Leiognathidae	Clupeoids	*Katsuwonus pelamis*	Clupeidae	*Thunnus albacares*	Carangidae	*Scomber* spp.	Others
1950	10,457	8,000	771	12,715	774	2,543	0	116,553
1951	10,511	8,000	890	12,807	1,150	2,561	0	120,290
1952	11,125	9,000	807	12,887	903	2,577	0	121,122
1953	11,748	7,100	723	12,983	655	3,697	0	123,591
1954	14,638	9,500	720	13,087	606	4,717	0	123,730
1955	13,537	11,600	717	13,137	557	4,027	0	123,140
1956	16,390	18,300	981	13,180	720	3,436	0	123,609
1957	15,303	14,100	1,245	13,253	883	3,351	0	124,536
1958	19,852	14,900	1,410	13,294	970	4,859	0	130,356
1959	18,749	17,000	1,576	13,341	1,055	5,968	0	131,502
1960	19,200	20,400	2,063	13,151	1,347	7,030	0	135,247
1961	18,094	28,400	2,551	13,192	1,639	6,838	0	135,467
1962	24,895	31,500	3,960	13,217	2,493	8,443	0	143,036
1963	21,509	22,400	5,369	13,228	3,348	9,846	0	147,226
1964	35,647	36,300	5,227	13,230	3,222	10,146	0	155,905
1965	23,203	24,200	5,084	13,224	3,096	6,545	3,000	147,536
1966	26,023	24,300	5,830	13,212	3,515	6,342	3,000	150,828
1967	27,706	20,000	6,576	13,190	3,931	8,638	3,000	158,357
1968	22,596	27,500	7,448	13,156	4,416	8,631	3,000	161,893
1969	30,482	21,700	8,322	13,105	4,901	8,621	4,000	168,164
1970	27,612	22,300	6,554	13,034	3,841	9,007	3,600	160,118
1971	25,861	18,400	4,785	12,942	2,783	7,588	5,100	151,986
1972	28,621	20,100	8,250	12,830	4,266	7,566	6,200	161,997
1973	26,281	20,600	9,919	12,700	5,244	8,440	4,900	164,443
1974	37,502	24,900	8,792	12,552	4,610	11,610	4,300	164,974
1975	42,447	32,530	6,937	12,387	3,771	8,637	7,994	166,294
1976	47,751	38,541	12,392	12,207	6,908	10,076	11,018	174,819
1977	41,644	46,278	11,583	12,010	5,806	11,192	9,179	166,788
1978	48,182	54,412	12,933	11,795	5,915	12,717	7,747	173,482
1979	37,957	59,276	9,692	11,557	6,555	12,440	13,388	173,344
1980	34,769	69,061	14,117	11,296	7,304	12,307	13,888	171,689
1981	47,292	64,479	15,196	11,151	8,068	12,796	12,906	189,926
1982	63,048	66,764	14,172	10,935	8,682	10,579	11,302	200,533
1983	49,864	70,971	14,649	10,705	9,264	10,726	15,518	185,937
1984	48,481	52,153	12,348	10,465	6,694	12,594	12,773	160,112
1985	33,183	27,682	13,699	10,217	7,160	10,139	13,000	196,803
1986	33,794	28,471	13,697	9,962	7,416	10,319	13,000	195,139
1987	34,848	29,460	14,442	10,108	7,785	10,638	13,000	199,916
1988	36,061	30,608	15,004	10,255	8,089	11,003	13,000	209,601
1989	36,590	31,064	16,500	10,400	8,727	11,165	13,000	216,687
1990	35,154	27,958	19,495	10,543	9,929	9,831	10,500	192,878
1991	40,141	33,426	21,990	10,683	11,934	11,112	12,000	219,721
1992	50,504	35,097	25,786	10,820	14,185	11,112	13,557	213,413
1993	49,542	37,379	29,692	10,951	16,478	13,068	10,854	233,113
1994	26,277	38,870	35,755	11,075	21,045	10,215	16,450	238,756
1995	48,498	49,785	33,915	11,190	16,499	9,148	17,642	230,633
1996	42,941	48,221	41,000	11,296	21,308	8,347	17,700	238,573
1997	42,681	47,200	50,012	11,393	27,094	9,179	20,000	231,641
1998	50,824	50,800	50,124	11,481	26,122	10,796	20,900	243,562
1999	35,840	51,370	64,316	11,562	32,767	10,992	21,350	242,307
2000	59,392	53,250	70,957	11,636	29,512	12,777	22,180	245,783
2001	35,461	49,270	66,692	11,698	26,522	12,290	16,760	226,183
2002	33,768	52,310	64,425	11,786	28,085	13,117	17,250	228,743
2003	79,929	56,390	75,146	11,954	34,425	17,331	17,760	249,705
2004	83,900	54,410	75,795	12,146	35,512	16,009	18,440	255,711
2005	21,620	24,870	44,938	6,489	24,887	7,248	9,680	121,769
2006	55,219	56,230	54,341	12,433	35,842	12,057	15,570	206,391
2007	59,779	63,520	73,240	12,524	32,998	13,885	16,290	212,857
2008	73,544	66,890	78,860	12,618	33,027	13,684	18,260	224,878