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CHANGES TO THE DATA AVAILABLE FOR STOCK ASSESSMENTS

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1. INTRODUCTION

This paper provides background information on some of the major changes to the data available for stock assessments in recent years. It does not attempt to describe **all** changes to the data, rather it describes where substantial changes occurred, primarily as a result of improved estimates and/or the availability of new information where data had been lacking in the past. SC6 Working Paper ST WP-1 (Williams, 2010) describes the current gaps in scientific data provisions to the WCPFC. This paper will describe, in more detail, the progress made in recent years in addressing the most important gaps and in improving the data available for stock assessments.

At this stage, we can only describe the work done in improving the aggregate catch/effort data for the Philippines and Indonesian domestic tuna fisheries, which has been acknowledged to be one of the most important data gaps for stock assessments. For future SC meetings, this paper will be extended to cover other major changes in data available for stock assessments, where relevant.

2. PHILIPPINES DOMESTIC FISHERIES DATA

2.1 Philippines fishery data - changes between SC4 and SC5

The following describes the background to the work conducted in April–May 2009 to prepare annual catch estimates and data for stock assessments from the Philippines in the lead-up to SC5, held in Port Vila, Vanuatu during August 2009. The changes involved the splitting of annual catch estimates for the hook-and-line/handline gear type into two distinct types of fisheries/gears for years prior to 1997. These data were subsequently used in all relevant stock assessments undertaken since May 2009.

The Philippines National Stock Assessment Project (NSAP) has been responsible for collecting port sampling data since 1997 and has provided essential data used in the process of determining annual catch estimates of the Philippines domestic fisheries by gear and species. Review of the NSAP data collected (e.g. Williams, 2004) showed that there are two distinct fisheries utilizing handlines or hook-and-lines based on the following criteria:

- **Differences in vessel size, number of crew, trip length and fishing strategy**. A fleet of "pump" boats based in General Santos City (GSC) may have up to 10-15 crew which undertake 10-25 day trips on-board a vessel which can carry several one-man canoe-type craft used to target large yellowfin. These vessels operate primarily at night around FADs utilizing handlines to target large yellowfin tuna at a depth typically greater than 100m. These vessels are distinct from the smaller vessels that generally conduct one-day trips with fewer crew, and target smaller tuna with troll and hook-and-line gear types around FADS during daylight hours at a depth considerably less than 100 m.
- **Size Composition**. Figure 1 shows the size composition of yellowfin catch sampled from the handline "pump" boats based in General Santos City, which we have termed the "large-fish" handline fishery. There is some inter-annual variation in size composition, but yellowfin size is mostly in the range of 90-140 cm (i.e. adult fish). Figure 2 shows the size composition of the small-scale hook-and-line vessels that are sampled in a number of ports throughout the Philippines. We refer to these vessels collectively as the "small-fish" handline fishery or the "small-fish" hook-and-line fishery. There is some inter-annual variation in the size composition of the catch, but the yellowfin catch is mostly in the range of 20-40 cm (i.e. small fish).
- **Species Composition**. Figure 3 shows the species composition of the catch of the "large-fish" handline fishery. Large yellowfin tuna comprise most of the catch from this fishery, with minor catches of bigeye tuna and others (e.g. billfish, opah (*Lampris* spp.); there are very few skipjack

caught and landed. Figure 4 shows the species composition of the small-fish hook-and-line vessels that are sampled in a number of ports throughout the Philippines. Yellowfin tuna are usually the predominant species in the catch of this fishery, but it is not as high a proportion of the overall catch as with the "large-fish" handline fishery. Higher proportions of skipjack, bigeye and other species are taken in this fishery.

The NSAP data provide the basis for determining the total catch volumes of the "large-fish" and "small-fish" handline fisheries when combined with the official annual catch estimates by species provided by the Philippines Bureau of Agricultural Statistics (BAS). The estimates for these two distinct fisheries for the years since the NSAP started (1997) have been included in the WCPFC Tuna Fishery Yearbook (see WCPFC, 2010) for a number of years. However, since port sampling data were not available for years prior to 1997, the catch estimates and aggregate data for these two fisheries had previously been combined into one fishery which was assigned to the "large-fish" handline fishery in the annual catch estimate and subsequently in the aggregate data made available for stock assessments.

Figures 5 and 7 show the annual catch estimates of yellowfin and bigeye tuna respectively, determined for these fisheries since 1970, prior to the recent revision to the annual catch estimates. While data are not available, it is clear through discussions and information provided by Philippines experts, that the fishery operated as two distinct fisheries with different gear types prior to 1997. Since there are no data available prior to 1997 to split the combined annual handline catches into 'large-fish' and 'small-fish', we determined the average proportion of catch from these respective fisheries for the period 1997-2007 and applied it to the annual combined handline catches for years prior to 1997. Figures 6 and 8 show the annual catch estimates of yellowfin and bigeye tuna determined for these fisheries after this revision to annual catch estimates. These data have subsequently been used in the stock assessments since May 2009.

2.2 Philippines fishery data - changes between SC5 and SC6

The following description refers to work that was undertaken during March–May 2010 to prepare annual catch estimates and data for stock assessments from the Philippines in the lead-up to SC6, to be held in Nuku'alofa, Tonga during August 2010.

Over the past year, there have been several important initiatives that have contributed to improving annual catch estimates for the Philippines, including:

- Provision of operational logsheet and cannery data for the domestic purse-seine fishery for recent years has resulted in better validation of the purse seine catch estimate.
- A study (Itano and Williams, 2009) was undertaken in late 2009 to determine the reliability of large bigeye and yellowfin tuna catch estimates determined for the Philippines Region 4B (Palawan), which is one of the main sources of the national annual catch estimates. The study identified several problems in the data collection system (e.g. species identification and bias in sampling due to low coverage) that resulted in a large over-estimation of the bigeye tuna catch. Most of the study's recommendations have now been implemented and, *inter alia,* resulted in the adjustment to the official Philippines national bigeye tuna catch estimate for 2009 (5,731t) which represents a downward revision to a level nearly seven-fold less than the bigeye tuna catch estimates for recent years. However, the official bigeye tuna estimates for previous years have yet to be adjusted.
- An Annual Catch Estimates Workshop (Anon, 2010b) was convened and attended by important stakeholders with knowledge and information about the tuna fisheries in the Philippines

(government, industry and NGOs). The outcome of this workshop was agreement on more reliable annual catch estimates for the Philippines tuna fisheries for recent years, and a plan for further improvement in the data collection and estimation processes in the coming years.

Anon. (2010b) contains a summary of deliberations from the recent annual catch estimates workshop and tables of revised annual catch estimates for 2000–2009 for the Philippines domestic fisheries, with brief notes referring to the methodology used in producing estimates. The outcome of this exercise and the changes in catch estimates from last year to this year are presented in Tables 1–3 (the changes are highlighted in yellow). The following provide a summary of some of the key findings regarding the catch estimates:

- There were no changes to the historical estimates for the purse-seine, ring-net, "large-fish" handline and "other" small-scale fisheries (not including hook-and-line).
- The catch estimates from the comprehensive, small-scale "hook-and-line" fishery in the Philippines have been the most problematic in the past. This fishery represents tens of thousands of vessels spread throughout the Philippines and the task of monitoring to them obtain representative estimates of catch is currently not possible. The workshop participants considered that recent tuna catch estimates in this fishery were too high, and consensus was reached on decreasing the estimate of the total tuna catch to a level of 70,000t, a reduction of 130,000t compared to the previous estimates. The NSAP species composition data was then used to obtain catch estimates by species. The corresponding reduction in catch estimates by species in recent years was 37,000t for skipjack, 22,000t for yellowfin and 1,000t for bigeye.
- The Philippines have longline vessels listed on the WCPFC Vessel Record but information at hand suggests that these vessels were not active in the WCPFC Convention Area during 2009, so no annual catch should be attributed to this fleet. Nevertheless, the NSAP data cover some domestic longline catch, and in the absence of any further information, the longline catch by species for years 1990-2009 was set to a value corresponding to the NSAP data. The previous longline catch estimates were clearly higher, but were understood to have included the foreign longline catch landed at Davao, Mindanao, which was incorrectly attributed to the Philippines fleet.

2.3 Philippines fishery data – Future work

Recommendations from the workshops conducted in the Philippines in May 2010 can be found in Anon (2010b). Further work is required to refine estimates in the purse seine fishery, and in particular the potential separation of the "baby" purse seine fleet, which appears to have a mode of operation and catch rates more aligned to the Philippines ring-net fleet (i.e. much lower CPUEs) than the larger purse seine vessels that fish beyond Philippine waters. More information has been requested from the "large-fish" handline fisheries landing in ports other than General Santos City. More information has also been requested for the non-NSAP ports that service the small-scale hook-and-line fisheries, noting that this fishery is acknowledged to be very difficult to adequately monitor throughout all areas of the Philippines.

3. INDONESIAN DOMESTIC FISHERIES DATA

3.1 Indonesia fishery data - changes between SC5 and SC6

The following refers to work that was undertaken during March–May 2010 to prepare annual catch estimates and data for stock assessments from Indonesia in the lead-up to SC6, to be held in Nuku'alofa, Tonga during August 2010.

The first Indonesian (WCPFC Area) Annual Catch Estimates Review Workshop was held in Jakarta during March 2010 (see Anon., 2010a). This workshop was attended by 24 participants from the Directorate General of Capture Fisheries (DGCF), the Research Center for Capture Fisheries (RCCF), port authority departments, fishing associations and the fishing industry. The outcome of this workshop was the production of annual catch estimates by gear and species for 2000–2009 for the Indonesian fisheries although the estimates excluded catch from archipelagic waters (the estimates only covered Fisheries Management Areas [FMAs] 716 and 717 – see Figure 9).

Anon. (2010a) contains a summary of deliberations from this workshop and tables of revised annual catch estimates for 2000–2009 for FMAs 716–717, with brief notes referring to the methodology in producing estimates. The agreed Provision of Scientific Data to the WCPFC[1] indicates that the data to be provided in each country's annual submission should cover the WPCFC Statistical Area (see Section 8, "*Definition of the WCPFC Statistical Area").* As the estimates produced in this workshop did not cover the WCPFC Statistical Area, further work was required to apply the species composition by gear type from the most recent estimates (Anon., 2010a) to the total tuna catch provided in previous years (for the Indonesian fisheries in the WCPFC Area) to produce the best estimate for the Indonesian fisheries by gear and species for the WCFPC Statistical Area. The outcome of this exercise and the changes in catch estimates from last year to this year are presented in Tables 4–6 (the changes are highlighted in yellow). The following provide a summary of some of the key findings regarding the catch estimates:

- For the pole-and-line fishery:
    - The new skipjack tuna catch estimates for 2000-2003 are slightly lower than the previous estimates whereas the estimates for 2004-2008 are slightly higher than the previous estimates.
    - The new yellowfin tuna catch estimates for 2000-2008 are generally lower than previous estimates.
    - The new bigeye tuna catch estimates are slightly higher than the previous estimates for 2000-2003, but considerably lower than the previous estimates for 2004-2008 as a result of the application of more reliable species composition data.
- For the "large-fish" handline fishery:
    - The new yellowfin tuna catch estimates are lower than the previous estimates for 2000-2003. The most recent estimates are more in line with the fishery developing over time, based on unsubstantiated, anecdotal information. The new yellowfin tuna catch estimates for 2004-2008 have been set higher, based on the available landings information.
    - The new bigeye tuna catch estimates are lower for 2000-2003. There were no estimates previously available for 2004-2008. These estimates were determined from species composition data (comparing to yellowfin tuna catch) for this fishery and are thought to be more accurate, but review of annual bigeye tuna estimates prior to 2000 will be required.
- For the longline fishery:
    - It was confirmed that the longline catch estimates for FMAs 716 and 717 produced for the workshop represent the majority of the longline catch estimates for all FMAs in the WCPFC Statistical Area, since most of the longline activity occurs in FMAs 716 and 717 and the catches from the main landing port (Bitung) are included in the estimates for FMAs 716 and

[1] http://www.wcpfc.int/doc/data-01/scientific-data-be-provided-commission-revised-wcpfc4-wcpfc6

717. For these reasons the longline catches for FMAs 716 and 717 were not raised and this accounts for part of the discrepancy in the total tuna catch from previous estimates compared to total tuna catch for the new estimates.
    - The new yellowfin tuna catch estimates for 2000-2008 are slightly lower than the previous estimates.
    - The new bigeye tuna catch estimates are higher for 2002-2003, but substantially lower for 2004-2008, due to the application of more reliable species composition data for this fishery.
- For the purse-seine fishery:
    - The new skipjack tuna catch estimates for 2000-2008 are substantially less than the previous estimates due to the new species composition information allocating a higher percentage of the catch to yellowfin and bigeye tuna at the expense of the skipjack catch.
    - The new yellowfin and bigeye tuna catch estimates for 2000-2008 are substantially higher than the previous estimates.
- The "other" fishery mainly covers the catches from the troll and small-fish handline gear types:
    - There were no catches of skipjack tuna assigned to this fishery for the years 1991-2008, even though it is acknowledged that skipjack are taken in this fishery. The new skipjack, yellowfin and bigeye tuna catch estimates for 1991-2008 were therefore determined from the species composition from the 'other' fishery for 1990, in the absence of any other sufficient and reliable species composition data from this fishery at this stage.
    - The revisions to the catch estimates for this fishery resulted in the establishment of a skipjack catch time series for years 1991-2009 with substantial corresponding reductions in yellowfin and bigeye tuna catches.
    - The workshop acknowledged that information on catch volumes and species composition for these gear types is lacking and more work on data collection for these gear types is required in the future.

3.2 Indonesia fishery data – Future work

Recommendations from the workshop conducted in Indonesia in March 2010 can be found in Anon, (2010a). The workshop acknowledged there was considerable work to do on annual catch estimates but that a process had been established and more refinement to annual catch estimates will hopefully occur over the next few years. The highest priority with annual catch estimates is to review the estimates for the period prior to 2000 to ensure they are consistent with the work done this year in producing more reliable estimates for the period after 2000. Hopefully, the issues that currently prevent Indonesia from providing catch estimates corresponding to the WFPFC Statistical Area will also be resolved in the near future.

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TABLES

Table 1. Changes to the Philippines domestic annual catch estimates for skipjack tuna.

Philippines SKIPJACK estimates (as at December 2009)							
YEAR	RINGNET	HANDLINE Large	HANDLINE Small	LONGLINE	PURSE SEINE	OTHER	TOTAL
1970	3,051	0	5,301	0	2,811	7,765	18,928
1971	3,265	0	5,672	0	3,007	8,309	20,253
1972	3,585	0	6,229	0	3,303	9,123	22,240
1973	4,028	0	6,997	0	3,710	10,250	24,985
1974	4,494	0	7,807	0	4,140	11,436	27,877
1975	4,830	0	8,391	0	4,449	12,290	29,960
1976	4,891	0	7,607	0	4,444	10,693	27,635
1977	4,765	0	13,475	0	15,647	18,478	52,365
1978	7,585	0	13,178	0	6,987	19,303	47,053
1979	5,702	0	10,006	0	22,426	4,946	43,080
1980	3,351	0	9,383	0	13,240	4,889	30,863
1981	4,683	0	14,406	0	14,048	4,862	37,999
1982	4,081	0	7,735	0	26,607	11,842	50,265
1983	4,210	0	8,999	0	36,645	6,751	56,605
1984	8,538	0	9,287	0	24,247	2,072	44,144
1985	14,303	0	10,309	0	28,477	6,712	59,801
1986	18,343	0	13,683	0	38,982	5,370	76,378
1987	11,873	0	14,627	0	39,125	6,105	71,730
1988	9,006	0	11,095	0	29,677	4,631	54,409
1989	10,409	0	12,823	0	34,300	5,352	62,884
1990	19,045	0	9,444	0	53,751	16,533	98,773
1991	14,612	0	9,598	0	62,078	15,449	101,737
1992	18,721	0	7,264	0	43,607	12,870	82,462
1993	19,226	0	8,349	0	34,547	5,480	67,602
1994	8,274	0	20,315	0	55,745	4,056	88,390
1995	10,200	0	23,523	0	66,315	1,958	101,996
1996	10,206	(0)	23,553	0	66,317	1,956	102,032
1997	8,803	0	29,457	0	55,769	597	94,626
1998	9,101	0	30,663	0	76,394	620	116,778
1999	11,012	0	27,624	0	82,543	548	121,727
2000	10,019	0	28,887	0	69,409	575	108,890
2001	9,654	0	27,005	0	65,920	538	103,117
2002	12,023	0	27,516	0	83,355	538	123,432
2003	13,541	0	34,527	0	99,013	668	147,749
2004	13,399	0	35,830	0	99,502	704	149,435
2005	12,363	0	48,217	0	91,372	836	152,788
2006	13,623	0	53,132	0	97,724	922	165,401
2007	16,629	0	61,327	0	128,178	1,064	207,198
2008	17,761	0	(61,327)	0	146,527	1,110	226,725

Philippines SKIPJACK estimates (as at June 2010)							
YEAR	RINGNET	HANDLINE Large	HANDLINE Small	LONGLINE	PURSE SEINE	OTHER	TOTAL
1970	3,051	0	5,301	0	2,811	7,765	18,928
1971	3,265	0	5,672	0	3,007	8,309	20,253
1972	3,585	0	6,229	0	3,303	9,123	22,240
1973	4,028	0	6,997	0	3,710	10,250	24,985
1974	4,494	0	7,807	0	4,140	11,436	27,877
1975	4,830	0	8,391	0	4,449	12,290	29,960
1976	4,891	0	7,607	0	4,444	10,693	27,635
1977	4,765	0	13,475	0	15,647	18,478	52,365
1978	7,585	0	13,178	0	6,987	19,303	47,053
1979	5,702	0	10,006	0	22,426	4,946	43,080
1980	3,351	0	9,383	0	13,240	4,889	30,863
1981	4,683	0	14,406	0	14,048	4,862	37,999
1982	4,081	0	7,735	0	26,607	11,842	50,265
1983	4,210	0	8,999	0	36,645	6,751	56,605
1984	8,538	0	9,287	0	24,247	2,072	44,144
1985	14,303	0	10,309	0	28,477	6,712	59,801
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1987	11,873	0	14,627	0	39,125	6,105	71,730
1988	9,006	0	11,095	0	29,677	4,631	54,409
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1990	19,045	0	9,444	0	53,751	16,533	98,773
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1992	18,721	0	7,264	0	43,607	12,870	82,462
1993	19,226	0	8,349	0	34,547	5,480	67,602
1994	8,274	0	20,315	0	55,745	4,056	88,390
1995	10,200	0	23,523	0	66,315	1,958	101,996
1996	10,206	(0)	23,553	0	66,317	1,956	102,032
1997	8,803	0	29,457	0	55,769	597	94,626
1998	9,101	0	30,663	0	76,394	620	116,778
1999	11,012	0	27,624	0	82,543	548	121,727
2000	10,019	0	28,887	0	69,409	575	108,890
2001	9,654	0	27,005	0	65,920	538	103,117
2002	12,023	0	24,951	0	83,355	538	120,867
2003	13,541	0	24,731	0	99,013	668	137,953
2004	13,399	0	24,993	0	99,502	704	138,598
2005	12,363	0	32,900	0	91,372	836	137,471
2006	13,623	0	32,900	0	97,724	922	145,169
2007	16,629	0	32,900	0	128,178	1,064	178,771
2008	17,761	0	32,900	0	146,527	1,355	198,543
2009	29,862	102	23,899	0	123,736	1,355	178,955

Table 2. Changes to the Philippines domestic annual catch estimates for yellowfin tuna.

Philippines YELLOWFIN estimates (as at December 2009)							
YEAR	RINGNET	HANDLINE Large	HANDLINE Small	LONGLINE	PURSE SEINE	OTHER	TOTAL
1970	1,511	3,835	15,340	537	4,277	3,604	29,104
1971	1,690	4,290	17,162	601	4,784	4,032	32,559
1972	1,757	4,458	17,833	625	4,972	4,188	33,833
1973	2,102	5,333	21,331	748	5,947	5,011	40,472
1974	2,444	6,200	24,798	869	6,914	5,825	47,050
1975	2,493	6,327	25,307	887	7,055	5,947	48,016
1976	2,100	5,330	21,321	748	5,945	5,008	40,452
1977	2,978	7,557	30,228	1,059	8,428	7,102	57,352
1978	910	4,559	18,237	630	3,720	6,145	34,201
1979	3,190	5,846	23,384	829	7,884	3,632	44,765
1980	3,852	5,344	21,377	1,076	7,369	3,107	42,125
1981	3,459	5,896	23,584	1,480	12,909	3,709	51,037
1982	1,251	5,452	21,809	1,734	14,659	2,350	47,255
1983	3,028	5,922	23,688	2,581	15,676	4,841	55,736
1984	3,839	5,668	22,671	1,174	16,855	3,282	53,489
1985	5,595	6,490	25,962	1,663	13,843	4,840	58,393
1986	4,461	6,615	26,461	2,204	11,376	2,988	54,105
1987	2,627	4,827	19,310	3,449	13,654	3,187	47,054
1988	3,633	5,865	23,461	2,897	12,830	3,167	51,853
1989	3,957	6,388	25,552	3,156	13,973	3,447	56,473
1990	3,760	9,012	36,049	2,015	14,515	8,366	73,717
1991	4,431	10,623	42,490	2,375	17,109	9,860	86,888
1992	2,447	4,420	17,681	1,114	10,895	4,324	40,881
1993	1,406	4,813	19,253	951	3,989	4,247	34,659
1994	1,464	7,433	29,733	1,450	13,919	5,043	59,042
1995	1,136	8,607	34,427	1,826	14,526	2,707	63,229
1996	1,144	(8,618)	34,470	1,834	14,618	2,721	63,405
1997	2,830	8,165	32,766	1,990	24,782	1,061	71,594
1998	3,665	9,198	37,861	2,306	10,983	1,222	65,235
1999	2,184	9,582	41,729	2,557	12,565	1,319	69,936
2000	3,148	9,454	41,991	2,570	23,088	1,333	81,584
2001	2,727	8,914	38,904	2,380	21,776	1,236	75,937
2002	1,995	9,943	45,406	2,789	16,650	1,420	78,203
2003	3,866	12,540	57,763	3,549	26,550	1,798	106,066
2004	4,560	13,099	58,974	3,622	28,744	1,849	110,848
2005	5,979	12,990	51,295	3,470	36,280	1,775	111,789
2006	6,175	14,498	56,524	3,824	44,420	1,956	127,397
2007	6,652	16,853	65,241	4,414	39,308	2,257	134,725
2008	8,421	15,712	(65,241)	5,052	43,787	7,915	146,128

Philippines YELLOWFIN estimates (as at June 2010)							
YEAR	RINGNET	HANDLINE Large	HANDLINE Small	LONGLINE	PURSE SEINE	OTHER	TOTAL
1970	1,511	3,835	15,340	537	4,277	3,604	29,104
1971	1,690	4,290	17,162	601	4,784	4,032	32,559
1972	1,757	4,458	17,833	625	4,972	4,188	33,833
1973	2,102	5,333	21,331	748	5,947	5,011	40,472
1974	2,444	6,200	24,798	869	6,914	5,825	47,050
1975	2,493	6,327	25,307	887	7,055	5,947	48,016
1976	2,100	5,330	21,321	748	5,945	5,008	40,452
1977	2,978	7,557	30,228	1,059	8,428	7,102	57,352
1978	910	4,559	18,237	630	3,720	6,145	34,201
1979	3,190	5,846	23,384	829	7,884	3,632	44,765
1980	3,852	5,344	21,377	1,076	7,369	3,107	42,125
1981	3,459	5,896	23,584	1,480	12,909	3,709	51,037
1982	1,251	5,452	21,809	1,734	14,659	2,350	47,255
1983	3,028	5,922	23,688	2,581	15,676	4,841	55,736
1984	3,839	5,668	22,671	1,174	16,855	3,282	53,489
1985	5,595	6,490	25,962	1,663	13,843	4,840	58,393
1986	4,461	6,615	26,461	2,204	11,376	2,988	54,105
1987	2,627	4,827	19,310	3,449	13,654	3,187	47,054
1988	3,633	5,865	23,461	2,897	12,830	3,167	51,853
1989	3,957	6,388	25,552	3,156	13,973	3,447	56,473
1990	3,760	9,012	36,049	484	14,515	8,366	72,186
1991	4,431	10,623	42,490	484	17,109	9,860	84,997
1992	2,447	4,420	17,681	484	10,895	4,324	40,251
1993	1,406	4,813	19,253	484	3,989	4,247	34,192
1994	1,464	7,433	29,733	484	13,919	5,043	58,076
1995	1,136	8,607	34,427	484	14,526	2,707	61,887
1996	1,144	(8,618)	34,470	484	14,618	2,721	62,055
1997	2,830	8,165	32,766	484	24,782	1,061	70,088
1998	3,665	9,198	37,861	484	10,983	1,222	63,413
1999	2,184	9,582	41,729	484	12,565	1,319	67,863
2000	3,148	9,454	41,991	484	23,088	1,333	79,498
2001	2,727	8,914	38,904	484	21,776	1,236	74,041
2002	1,995	9,943	41,173	484	16,650	1,420	71,666
2003	3,866	12,540	41,375	484	26,550	1,798	86,613
2004	4,560	13,099	41,137	484	28,744	1,849	89,873
2005	5,979	12,990	35,000	484	36,280	1,775	92,508
2006	6,175	14,498	35,000	484	44,420	1,956	102,534
2007	6,652	16,853	35,000	484	39,308	2,257	100,554
2008	8,421	15,712	35,000	484	43,787	1,327	104,731
2009	7,347	7,768	43,172	484	21,381	1,327	81,479

Table 3. Changes to the Philippines domestic annual catch estimates for bigeye tuna.

Philippines BIGEYE estimates (as at December 2009)							
YEAR	RINGNET	HANDLINE Large	HANDLINE Small	LONGLINE	PURSE SEINE	OTHER	TOTAL
1970	166	119	1,685	51	475	400	2,896
1971	186	133	1,885	57	532	448	3,241
1972	193	138	1,959	59	552	466	3,367
1973	231	165	2,344	70	661	557	4,028
1974	268	191	2,726	82	768	647	4,682
1975	274	195	2,781	83	784	660	4,777
1976	231	165	2,343	70	661	557	4,027
1977	327	233	3,322	100	936	789	5,707
1978	100	141	2,004	59	413	683	3,400
1979	351	181	2,569	78	876	404	4,459
1980	423	165	2,349	101	819	345	4,202
1981	380	182	2,592	139	1,434	413	5,140
1982	137	168	2,397	163	1,629	262	4,756
1983	333	183	2,603	243	1,742	538	5,642
1984	422	175	2,491	110	1,873	365	5,436
1985	615	201	2,852	156	1,538	538	5,900
1986	490	204	2,908	207	1,264	332	5,405
1987	289	149	2,122	325	1,517	354	4,756
1988	399	181	2,578	273	1,426	352	5,209
1989	435	197	2,808	297	1,553	383	5,673
1990	413	278	3,962	190	1,613	929	7,385
1991	487	328	4,670	224	1,901	1,096	8,706
1992	269	137	1,943	105	1,211	481	4,146
1993	155	149	2,115	90	443	472	3,424
1994	161	271	3,856	161	1,547	539	6,535
1995	125	314	4,465	203	1,614	280	7,001
1996	126	(314)	4,471	204	1,624	282	7,021
1997	257	531	3,084	221	4,987	117	9,197
1998	359	401	3,563	256	7,043	116	11,738
1999	146	175	3,927	284	873	124	5,529
2000	457	510	3,951	286	5,513	125	10,842
2001	285	349	3,659	264	3,423	117	8,097
2002	37	336	4,274	310	1,105	140	6,202
2003	385	472	5,436	394	2,436	190	9,313
2004	311	263	5,548	403	3,193	174	9,892
2005	336	670	3,078	729	6,719	167	11,699
2006	823	555	3,391	804	5,923	184	11,680
2007	713	521	3,914	927	3,418	213	9,706
2008	322	637	(3,914)	643	3,762	210	9,488

Philippines BIGEYE estimates (as at June 2010)							
YEAR	RINGNET	HANDLINE Large	HANDLINE Small	LONGLINE	PURSE SEINE	OTHER	TOTAL
1970	166	119	1,685	51	475	400	2,896
1971	186	133	1,885	57	532	448	3,241
1972	193	138	1,959	59	552	466	3,367
1973	231	165	2,344	70	661	557	4,028
1974	268	191	2,726	82	768	647	4,682
1975	274	195	2,781	83	784	660	4,777
1976	231	165	2,343	70	661	557	4,027
1977	327	233	3,322	100	936	789	5,707
1978	100	141	2,004	59	413	683	3,400
1979	351	181	2,569	78	876	404	4,459
1980	423	165	2,349	101	819	345	4,202
1981	380	182	2,592	139	1,434	413	5,140
1982	137	168	2,397	163	1,629	262	4,756
1983	333	183	2,603	243	1,742	538	5,642
1984	422	175	2,491	110	1,873	365	5,436
1985	615	201	2,852	156	1,538	538	5,900
1986	490	204	2,908	207	1,264	332	5,405
1987	289	149	2,122	325	1,517	354	4,756
1988	399	181	2,578	273	1,426	352	5,209
1989	435	197	2,808	297	1,553	383	5,673
1990	413	278	3,962	59	1,613	929	7,254
1991	487	328	4,670	59	1,901	1,096	8,541
1992	269	137	1,943	59	1,211	481	4,100
1993	155	149	2,115	59	443	472	3,393
1994	161	271	3,856	59	1,547	539	6,433
1995	125	314	4,465	59	1,614	280	6,857
1996	126	(314)	4,471	59	1,624	282	6,876
1997	257	531	3,084	59	4,987	117	9,035
1998	359	401	3,563	59	7,043	116	11,541
1999	146	175	3,927	59	873	124	5,304
2000	457	510	3,951	59	5,513	125	10,615
2001	285	349	3,659	59	3,423	117	7,892
2002	37	336	3,876	59	1,105	140	5,553
2003	385	472	3,894	59	2,436	190	7,436
2004	311	263	3,870	59	3,193	174	7,870
2005	336	670	2,100	59	6,719	167	10,052
2006	823	555	2,100	59	5,923	184	9,644
2007	713	521	2,100	59	3,418	213	7,024
2008	322	637	(2,100)	59	3,762	15	6,895
2009	291	330	(2,929)	59	2,663	15	6,286

Table 4. Changes to the Indonesian annual catch estimates for skipjack.

Indonesia SKIPJACK estimates (as at December 2009)							
YEAR	POLE-AND-LINE	HANDLINE Large	HANDLINE Small	LONGLINE	PURSE SEINE	OTHER	TOTAL
1970	...	...	...	...	...	12,100	12,100
1971	...	...	...	...	...	12,400	12,400
1972	...	...	...	...	...	19,600	19,600
1973	...	...	...	...	...	22,300	22,300
1974	...	...	...	...	...	23,613	23,613
1975	...	...	...	...	...	23,316	23,316
1976	0	...	...	...	...	25,338	25,338
1977	0	...	...	...	...	26,376	26,376
1978	0	...	...	0	...	29,422	29,422
1979	0	...	...	0	...	36,310	36,310
1980	19,676	...	...	0	5,514	19,055	44,245
1981	20,865	...	...	0	5,847	20,207	46,919
1982	22,121	...	...	0	6,199	21,380	49,700
1983	28,609	...	...	0	8,017	27,706	64,332
1984	42,910	0	...	0	9,152	18,149	70,211
1985	43,999	0	...	0	10,187	18,132	72,318
1986	48,305	0	...	0	7,313	13,225	68,843
1987	49,271	0	...	0	7,459	13,490	70,220
1988	51,735	0	...	0	7,823	14,165	73,723
1989	64,763	0	...	0	7,559	14,873	87,195
1990	70,537	0	...	0	7,994	15,617	94,148
1991	91,998	0	...	0	16,709	0	108,707
1992	100,583	0	...	0	26,036	0	126,619
1993	86,871	0	...	0	30,132	0	117,003
1994	87,008	0	...	0	38,990	0	125,998
1995	82,636	0	...	0	46,758	0	129,394
1996	82,577	(0)	...	0	58,166	0	140,743
1997	73,180	0	...	0	63,654	0	136,834
1998	89,329	0	...	0	95,657	0	184,986
1999	86,375	0	...	0	114,038	0	200,413
2000	71,893	0	...	0	117,765	0	189,658
2001	54,409	0	...	0	111,900	0	166,309
2002	44,543	0	...	0	117,288	0	161,831
2003	35,337	0	...	0	122,891	0	158,228
2004	31,279	0	...	0	151,197	0	182,476
2005	34,894	0	...	0	168,670	0	203,564
2006	38,889	0	...	0	187,980	0	226,869
2007	39,362	0	...	0	190,268	0	229,630
2008	39,362	0	...	0	190,268	0	229,630

Indonesia SKIPJACK estimates (as at June 2010)							
YEAR	POLE-AND-LINE	HANDLINE Large	HANDLINE Small	LONGLINE	PURSE SEINE	OTHER	TOTAL
1970	...	...	...	...	...	12,100	12,100
1971	...	...	...	...	...	12,400	12,400
1972	...	...	...	...	...	19,600	19,600
1973	...	...	...	...	...	22,300	22,300
1974	...	...	...	...	...	23,613	23,613
1975	...	...	...	...	...	23,316	23,316
1976	0	...	...	...	...	25,338	25,338
1977	0	...	...	...	...	26,376	26,376
1978	0	...	...	0	...	29,422	29,422
1979	0	...	...	0	...	36,310	36,310
1980	19,676	...	...	0	5,514	19,055	44,245
1981	20,865	...	...	0	5,847	20,207	46,919
1982	22,121	...	...	0	6,199	21,380	49,700
1983	28,609	...	...	0	8,017	27,706	64,332
1984	42,910	0	...	0	9,152	18,149	70,211
1985	43,999	0	...	0	10,187	18,132	72,318
1986	48,305	0	...	0	7,313	13,225	68,843
1987	49,271	0	...	0	7,459	13,490	70,220
1988	51,735	0	...	0	7,823	14,165	73,723
1989	64,763	0	...	0	7,559	14,873	87,195
1990	70,537	0	...	0	7,994	27,886	106,417
1991	91,998	0	...	0	16,709	23,054	131,761
1992	100,583	0	...	0	26,036	26,324	152,943
1993	86,871	0	...	0	30,132	21,314	138,317
1994	87,008	0	...	0	38,990	26,280	152,278
1995	82,636	0	...	0	46,758	27,964	157,358
1996	82,577	(0)	...	0	58,166	33,252	173,995
1997	73,180	0	...	0	63,654	27,793	164,627
1998	89,329	0	...	0	95,657	34,379	219,365
1999	86,375	0	...	0	114,038	35,521	235,934
2000	64,799	0	...	0	87,730	40,254	192,783
2001	50,306	0	...	0	83,095	36,527	169,928
2002	43,165	0	...	0	87,267	39,399	169,832
2003	34,944	0	...	0	90,402	34,607	159,953
2004	38,164	0	...	0	113,991	18,585	170,740
2005	37,121	0	...	0	118,033	17,397	172,551
2006	48,504	0	...	0	154,233	17,842	220,579
2007	48,937	0	...	0	138,341	17,690	204,969
2008	50,949	0	...	0	149,420	17,690	218,059
2009	48,361	0	...	0	144,539	17,690	210,590

Table 5. Changes to the Indonesian annual catch estimates for yellowfin tuna.

Indonesia YELLOWFIN estimates (as at December 2009)							
YEAR	POLE-AND-LINE	HANDLINE Large	HANDLINE Small	LONGLINE	PURSE SEINE	OTHER	TOTAL
1970	...	...	...	...	...	4,950	4,950
1971	...	...	...	...	...	5,130	5,130
1972	...	...	...	...	...	8,100	8,100
1973	...	...	...	...	...	9,180	9,180
1974	...	...	...	...	...	9,149	9,149
1975	...	...	...	...	...	9,956	9,956
1976	456	...	...	...	...	6,777	7,233
1977	532	...	...	...	...	9,241	9,773
1978	1,044	...	...	1,111	...	7,403	9,558
1979	1,716	...	...	1,164	...	10,334	13,214
1980	2,042	...	...	1,351	1,959	10,463	15,815
1981	1,814	...	...	1,651	2,048	14,213	19,726
1982	1,698	...	...	3,295	1,285	15,654	21,932
1983	1,710	...	...	958	1,812	13,715	18,195
1984	2,054	2,057	...	1,526	1,897	16,326	23,860
1985	2,110	2,322	...	2,254	1,896	18,117	26,699
1986	2,050	2,502	...	2,227	1,485	22,703	30,967
1987	2,091	2,553	...	8,458	1,515	22,259	36,876
1988	2,195	2,650	...	8,881	1,590	23,739	39,055
1989	3,198	2,492	...	4,683	2,268	28,211	40,852
1990	3,990	2,921	...	5,034	2,399	29,057	43,401
1991	5,660	4,029	...	6,365	2,586	35,643	54,283
1992	5,887	5,389	...	7,017	2,435	40,698	61,426
1993	4,767	4,363	...	5,410	3,926	32,953	51,419
1994	6,291	6,740	...	5,041	5,288	40,630	63,990
1995	6,694	7,172	...	5,364	5,627	43,233	68,090
1996	7,960	(8,528)	...	6,378	6,691	51,408	80,965
1997	6,654	7,128	...	5,331	5,592	42,970	67,675
1998	8,230	8,816	...	6,594	6,917	53,150	83,707
1999	8,503	9,110	...	6,813	7,147	54,917	86,490
2000	9,636	10,324	...	7,721	8,099	62,234	98,014
2001	8,744	9,368	...	7,006	7,349	56,472	88,939
2002	9,432	10,104	...	7,557	7,927	60,913	95,933
2003	8,285	8,875	...	6,637	6,962	53,504	84,263
2004	11,449	1,041	...	10,929	10,408	18,215	52,042
2005	10,488	954	...	10,012	9,535	16,686	47,675
2006	14,041	1,277	...	13,403	12,764	22,337	63,822
2007	13,877	1,262	...	13,247	12,616	22,078	63,080
2008	13,877	1,262	...	13,247	12,616	22,078	63,080

Indonesia YELLOWFIN estimates (as at June 2010)							
YEAR	POLE-AND-LINE	HANDLINE Large	HANDLINE Small	LONGLINE	PURSE SEINE	OTHER	TOTAL
1970	...	...	...	...	...	4,950	4,950
1971	...	...	...	...	...	5,130	5,130
1972	...	...	...	...	...	8,100	8,100
1973	...	...	...	...	...	9,180	9,180
1974	...	...	...	...	...	9,149	9,149
1975	...	...	...	...	...	9,956	9,956
1976	456	...	...	...	...	6,777	7,233
1977	532	...	...	...	...	9,241	9,773
1978	1,044	...	...	1,111	...	7,403	9,558
1979	1,716	...	...	1,164	...	10,334	13,214
1980	2,042	...	...	1,351	1,959	10,463	15,815
1981	1,814	...	...	1,651	2,048	14,213	19,726
1982	1,698	...	...	3,295	1,285	15,654	21,932
1983	1,710	...	...	958	1,812	13,715	18,195
1984	2,054	2,057	...	1,526	1,897	16,326	23,860
1985	2,110	2,322	...	2,254	1,896	18,117	26,699
1986	2,050	2,502	...	2,227	1,485	22,703	30,967
1987	2,091	2,553	...	8,458	1,515	22,259	36,876
1988	2,195	2,650	...	8,881	1,590	23,739	39,055
1989	3,198	2,492	...	4,683	2,268	28,211	40,852
1990	3,990	2,921	...	5,034	2,399	18,015	32,359
1991	5,660	4,029	...	6,365	2,586	14,894	33,534
1992	5,887	5,389	...	7,017	2,435	17,006	37,734
1993	4,767	4,363	...	5,410	3,926	13,770	32,236
1994	6,291	6,740	...	5,041	5,288	16,978	40,338
1995	6,694	7,172	...	5,364	5,627	18,066	42,923
1996	7,960	(8,528)	...	6,378	6,691	21,482	51,039
1997	6,654	7,128	...	5,331	5,592	17,955	42,660
1998	8,230	8,816	...	6,594	6,917	22,210	52,767
1999	8,503	9,110	...	6,813	7,147	22,948	54,521
2000	14,070	1,888	...	3,104	35,605	26,005	80,672
2001	10,923	2,434	...	4,001	33,724	23,598	74,679
2002	9,372	3,799	...	6,243	35,417	25,453	80,285
2003	7,587	5,603	...	9,209	36,689	22,357	81,447
2004	8,287	5,666	...	9,313	46,263	12,007	81,535
2005	11,000	6,613	...	10,762	57,906	11,239	97,520
2006	8,828	6,571	...	9,482	44,253	11,527	80,660
2007	9,298	5,445	...	10,371	63,524	11,428	100,066
2008	7,493	5,273	...	11,347	52,496	11,428	88,037
2009	9,530	5,976	...	10,491	56,716	11,428	94,141

Table 6. Changes to the Indonesian annual catch estimates for bigeye tuna.

Indonesia BIGEYE estimates (as at December 2009)							
YEAR	POLE-AND-LINE	HANDLINE Large	HANDLINE Small	LONGLINE	PURSE SEINE	OTHER	TOTAL
1970	...	...	...	...	...	550	550
1971	...	...	...	...	...	570	570
1972	...	...	...	...	...	900	900
1973	...	...	...	...	...	1,020	1,020
1974	...	...	...	...	...	1,017	1,017
1975	...	...	...	...	...	1,106	1,106
1976	51	...	...	...	...	753	804
1977	59	...	...	...	...	1,027	1,086
1978	116	...	...	105	...	823	1,044
1979	191	...	...	110	...	1,148	1,449
1980	227	...	...	127	218	1,163	1,735
1981	202	...	...	155	228	1,579	2,164
1982	189	...	...	310	143	1,739	2,381
1983	190	...	...	90	201	1,524	2,005
1984	228	194	...	144	211	1,814	2,591
1985	234	218	...	212	(211)	2,013	2,888
1986	228	235	...	210	165	2,523	3,361
1987	232	240	...	796	168	2,473	3,909
1988	244	249	...	836	177	2,638	4,144
1989	355	234	...	441	252	3,135	4,417
1990	443	275	...	474	267	3,229	4,688
1991	629	379	...	599	287	3,960	5,854
1992	654	507	...	660	271	4,522	6,614
1993	530	411	...	509	436	3,661	5,547
1994	699	634	...	474	588	4,514	6,909
1995	744	675	...	505	625	4,804	7,353
1996	884	802	...	600	743	5,712	8,741
1997	739	671	...	502	621	4,774	7,307
1998	914	830	...	620	769	5,906	9,039
1999	945	857	...	641	794	6,102	9,339
2000	1,071	971	...	727	900	6,915	10,584
2001	972	881	...	659	817	6,275	9,604
2002	1,048	951	...	711	881	6,768	10,359
2003	921	835	...	625	774	5,945	9,100
2004	5,920	0	...	8,413	3,116	13,711	31,160
2005	5,423	0	...	7,707	2,855	13,198	29,183
2006	7,260	0	...	10,317	3,821	8,313	29,711
2007	7,176	0	...	10,197	3,777	8,310	29,460
2008	(7,176)	0	...	(10,197)	(3,777)	(8,310)	(29,460)

Indonesia BIGEYE estimates (as at June 2010)							
YEAR	POLE-AND-LINE	HANDLINE Large	HANDLINE Small	LONGLINE	PURSE SEINE	OTHER	TOTAL
1970	...	...	...	...	...	550	550
1971	...	...	...	...	...	570	570
1972	...	...	...	...	...	900	900
1973	...	...	...	...	...	1,020	1,020
1974	...	...	...	...	...	1,017	1,017
1975	...	...	...	...	...	1,106	1,106
1976	51	...	...	...	...	753	804
1977	59	...	...	...	...	1,027	1,086
1978	116	...	...	105	...	823	1,044
1979	191	...	...	110	...	1,148	1,449
1980	227	...	...	127	218	1,163	1,735
1981	202	...	...	155	228	1,579	2,164
1982	189	...	...	310	143	1,739	2,381
1983	190	...	...	90	201	1,524	2,005
1984	228	194	...	144	211	1,814	2,591
1985	234	218	...	212	(211)	2,013	2,888
1986	228	235	...	210	165	2,523	3,361
1987	232	240	...	796	168	2,473	3,909
1988	244	249	...	836	177	2,638	4,144
1989	355	234	...	441	252	3,135	4,417
1990	443	275	...	474	267	2,002	3,461
1991	629	379	...	599	287	1,655	3,549
1992	654	507	...	660	271	1,890	3,982
1993	530	411	...	509	436	1,530	3,416
1994	699	634	...	474	588	1,887	4,282
1995	744	675	...	505	625	2,007	4,556
1996	884	802	...	600	743	2,387	5,416
1997	739	671	...	502	621	1,995	4,528
1998	914	830	...	620	769	2,468	5,601
1999	945	857	...	641	794	2,550	5,787
2000	3,731	38	...	731	3,465	2,890	10,854
2001	2,897	49	...	942	3,282	2,622	9,791
2002	2,485	76	...	1,470	3,447	2,828	10,307
2003	2,012	113	...	2,168	3,571	2,484	10,347
2004	2,197	114	...	2,192	4,502	1,334	10,340
2005	2,684	133	...	2,202	5,155	1,249	11,423
2006	2,859	132	...	3,011	6,115	1,281	13,397
2007	2,180	109	...	1,993	4,830	1,270	10,382
2008	1,972	106	...	1,649	4,780	1,270	9,777
2009	2,523	120	...	2,214	5,441	1,270	11,568

FIGURES

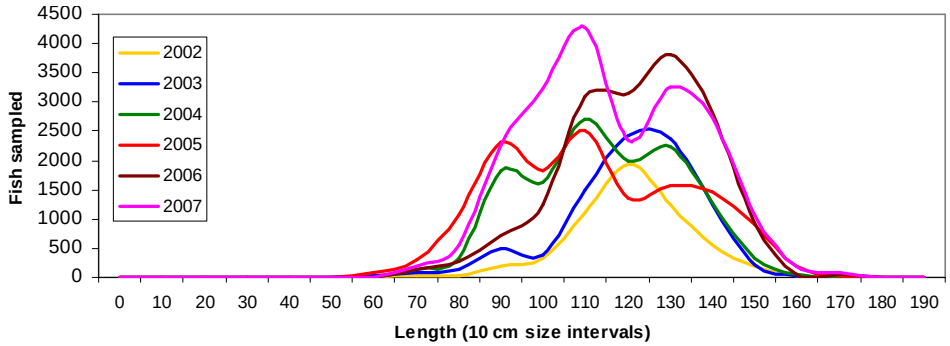

Figure 1. Annual size composition for yellowfin tuna sampled from "large-fish" handline vessels based in GSC, 2002-2007 (NSAP data)

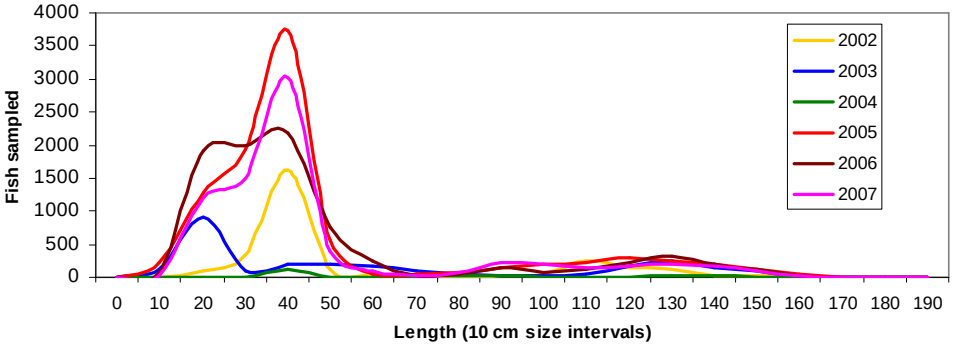

Figure 2. Annual size composition for yellowfin tuna sampled from "small-fish" hook-and-line vessels based in the Philippines, 2002-2007 (NSAP data)

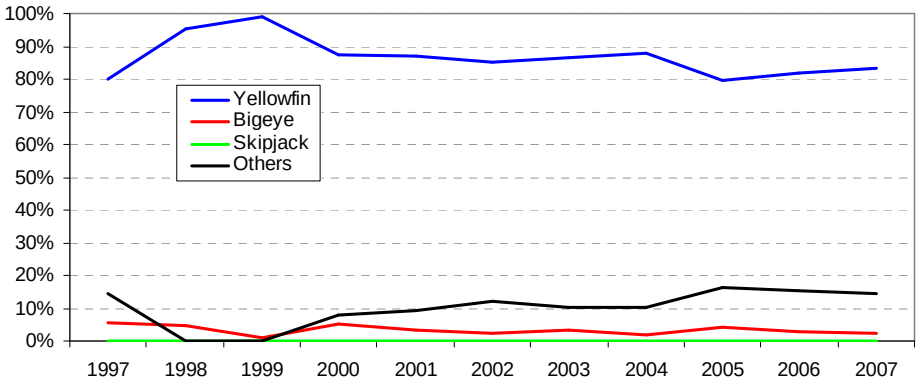

Figure 3. Annual trends in yellowfin, skipjack and bigyeye tuna species composition of the GSC "large-fish" handline fleet, 1997-2007 (NSAP data)

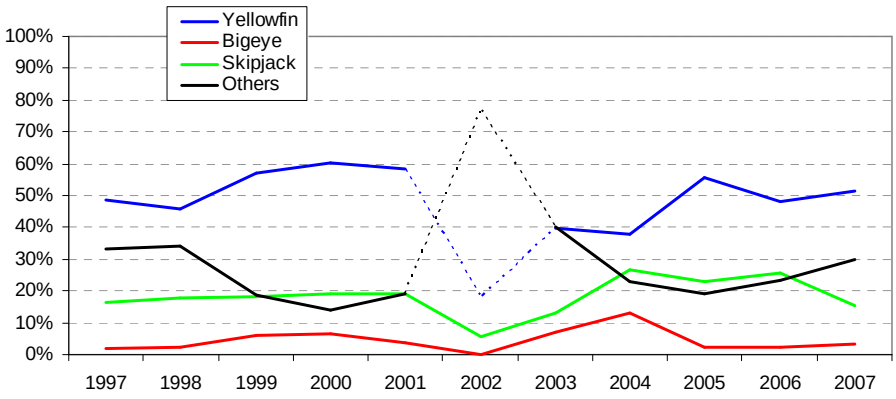

Figure 4. Annual trends in yellowfin, skipjack and bigyeye tuna species composition of the "small-fish" hook-and-line fleet in the Philippines, 1997-2007 (NSAP data)

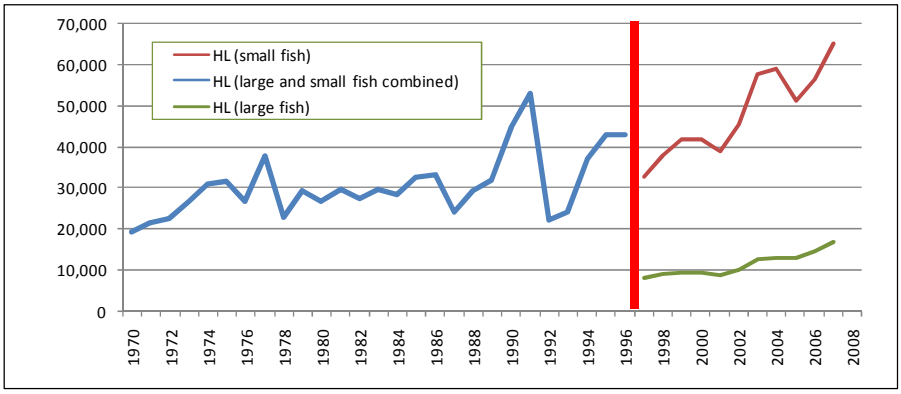

Figure 5. Annual yellowfin tuna catch estimates for the Philippines small-fish and large-fish handline fisheries
(prior to May 2009)

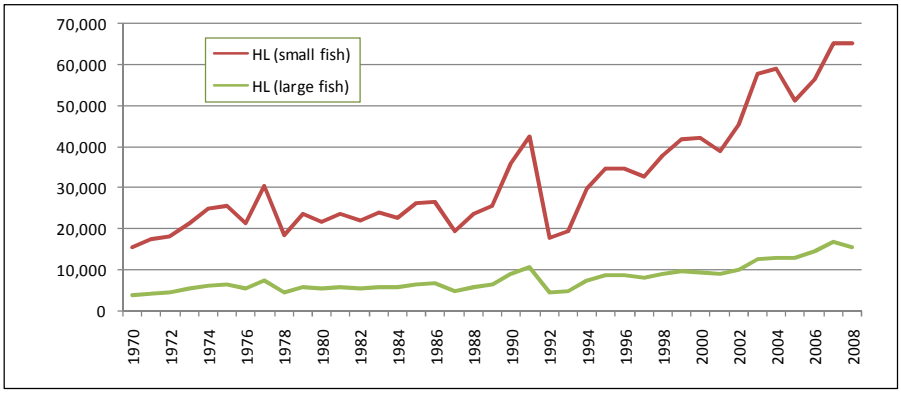

Figure 6. Annual yellowfin tuna catch estimates for the Philippines handline fisheries
(after the revision to pre-1997 estimates in May 2009)

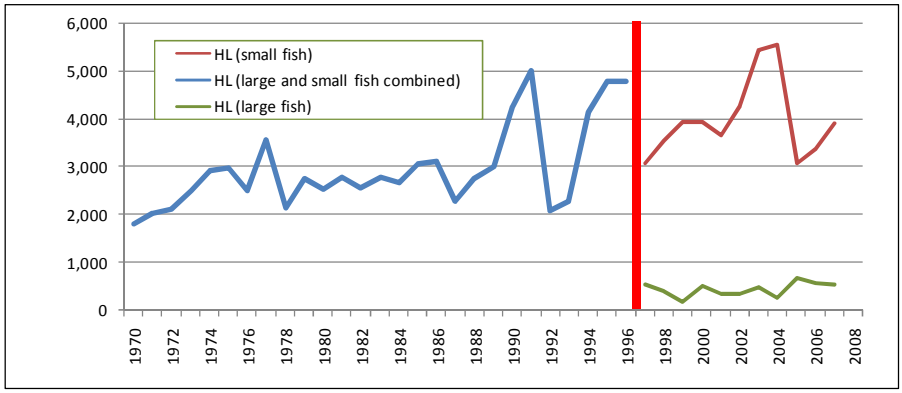

Figure 7. Annual bigeye tuna catch estimates for the Philippines handline fisheries (prior to May 2009)

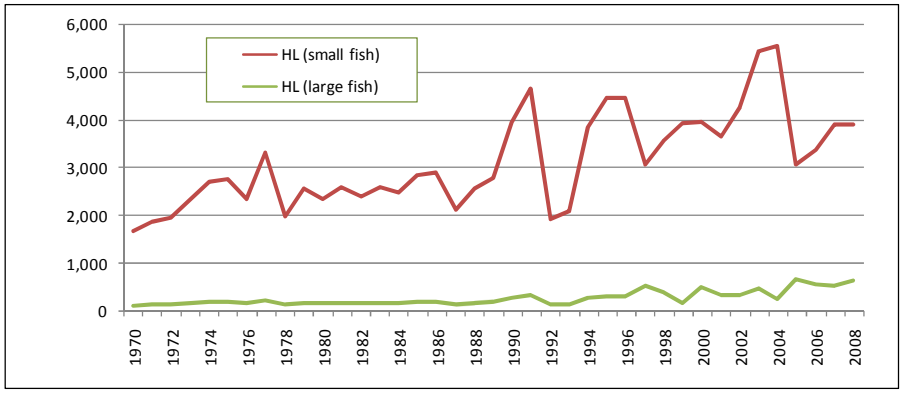

Figure 8. Annual bigeye tuna catch estimates for the Philippines handline fisheries (after the revision to pre-1997 estimates in May 2009)

Figure 9. Indonesia Fisheries Management Areas (FMAs) in the WCFPC Statistical Area

713 (Makassar Strait, Bone Bay, Flores Sea, Bali Sea)
714 (Banda Sea, Tolo Bay)
715 (Maluku Sea, Tomini Bay, Seram Sea, Berau Bay)
716 (Sulawesi Sea, Halmahera Sea)
717 (Pacific Ocean)
718 (Aru Sea, Arafura Sea, Timor Sea)