



CCSBT-CC/2110/16

**Trial analysis for verification of reported catch by Members with CDS data and
CDS tag survey data obtained from Japanese market**

(CC agenda item 7.2.2)

1. Purpose of this document

In response to the request by the 2020 Extended Commission (EC) meeting, this paper presents trial analysis for verification of reported catch by Members with Catch Documentation Scheme (CDS) data and CDS tag survey data obtained from Japanese market for consideration by the Compliance Committee (CC).

2. Background

In 2019, CCSBT 26 adopted the new Management Procedure (MP, named Cape Town Procedure) recommended by the 2019 ESC meeting. However, at CCSBT 26, two CCSBT Members advised that *“at CCSBT 27, they would need to see that there had been real and measurable progress towards resolving current farm uncertainties and satisfactory progress on the market study proposal to investigate uncertainties before they could agree to any increased TAC that may be recommended by the MP”*. Japan committed to submit a paper to the ESC and CCSBT 27, which will include a proposal to compare Japanese market data with catch data from all Members to identify any anomalies or discrepancies.

In 2020, based on its commitment in 2019, Japan submitted a proposal to ESC 25 on monitoring of SBT distribution in Japan to verify catch of all Members¹. Based on the discussion by the ESC, Japan further submitted suggested actions to EC 27 to implement “Japan’s market proposal”². After the discussion on the proposal’s budgetary implications by the 2020 Finance and Administration Committee, the EC 27 accepted the suggested actions proposed by Japan.

As a part of suggested actions to implement Japan’s market proposal, the Secretariat was requested to conduct a trial analysis for verification of reported catch by Members with Japan’s market CDS tag survey data obtained from Japanese market from 2010 to 2020 and Catch Tagging Form (CTF) data (details are shown at item b(3), Attachment 6 and Attachment 7 of Japan’s market proposal^{1,2}).

¹ [CCSBT-ESC/2008/23](#)

² [CCSBT-EC/2010/19](#)

3. Data used for this trial analysis

The Secretariat used the following datasets to conduct this trial analysis.

1) *Individual SBT data from CCSBT CDS Catch Tagging Forms (2010-2020)*

These data are collected from Members and maintained by the Secretariat through Catch Documentation Scheme (CDS) since 2010 to date.

This dataset includes CDS tag number, product type, product weight and fork length of each fish, fishing information, origin of fish (Member, wild/farming) etc³.

The numbers of CDS tags recorded on CTFs by Member are shown in Table 1 below.

Table 1. Number of CDS tags (= number of SBT) recorded on CTFs by Member and year.

	AU	ID	JP	KR	NZ	TW	ZA	Grand Total
2010	185,538	4,990	38,558	14,898	8,473	33,028	557	287,138
2011	213,830	11,936	63,282	13,291	8,811	15,156	687	328,047
2012	288,855	9,165	51,205	15,743	13,537	17,451	972	397,998
2013	278,440	18,187	49,459	19,540	11,922	33,553	478	412,827
2014	266,731	11,573	58,814	15,835	13,800	26,659	461	395,088
2015	301,638	5,944	85,182	22,000	14,973	33,004	645	463,386
2016	324,200	6,362	80,348	19,112	19,763	30,392	620	480,797
2017	275,531	9,617	85,019	18,352	19,255	32,845	1,210	441,829
2018	341,346	10,946	106,627	20,310	19,919	35,495	2,294	536,937
2019	360,174	12,834	112,021	21,116	16,548	34,615	2,539	559,847
2020	344,072	13,578	91,098	17,931	15,418	28,826	1,311	512,234
Grand Total	3,180,355	115,132	821,613	198,128	162,419	321,024	11,774	4,816,128

2) *Japan's market CDS tag survey data (2010-2020)*

This dataset is provided by Japan. These data were obtained through Japan's market CDS tag survey (hereinafter "Market Survey") in the major Japanese wholesale market⁴.

This dataset includes date of survey, CDS tag number, market place, fishing vessel ID (call sign), product weight of fish, name of whole seller, and origin of fish (Member, wild or farming) etc.

The number of fish observed/recorded by Japan's Market Survey by Member is shown in Table 2 below.

Table 2. Number of SBT observed/recorded by the Market Survey by Member.

	AU	ID	JP	KR	NZ	TW	ZA	Total
Number of observed SBT in Market Survey (2010-2020)	997	893	66,345	14,095	1,178	13,741	124	97,373

³ Details are available at Appendix 1 of the [Resolution on the Implementation of a CCSBT Catch Documentation Scheme](#).

⁴ Japan has voluntarily conducted SBT management tag survey twice a month at Toyosu market (as well as at Tsukiji and Yaizu market since 2007).

It should be noted that the data recorded in the Market Survey data described above contained a significant number of missing or incomplete data. This was mainly due to the fact that, during the Market Survey, there were a significant number of SBT individuals for which the complete CDS tag number could not be recorded for some reason, such as the tag was embedded in frozen SBT meat, the tag was partially damaged, or the tag was detached, or a recording error by the surveyor.

4. Trial Analysis

The Secretariat conducted trial analyses using the datasets described in Section 3 above.

1) *Data preparation for trial analysis*

In order to integrate the two datasets described in Section 3, the Secretariat imported the Market Survey data provided by Japan into the CDS database, and matched the data by CDS tag numbers common to both the Market Survey dataset and the CTF dataset.

The number of SBT individuals with matching CDS tag numbers between the Market Survey data and the CTF data is shown in Table 3 below.

Table 3. Number of matches of CDS tag numbers between the Market Survey data and CTF data.

Member	Number of observed SBT in Market Survey (2010-2020) (A)	Number of observed tags		Rate		
		"Readable" tag numbers (B)	Number of "matched" tag numbers (C)	"Readable" rate against all records (B/A)	CTF - Matching rate against all records (C/A)	CTF - Matching rate against "readable" tag (C/B)
AU	997	565	546	56.67%	54.76%	96.64%
ID	893	572	484	64.05%	54.20%	84.62%
JP	66,345	52,922	50,996	79.77%	76.86%	96.36%
KR	14,095	6,140	6,005	43.56%	42.60%	97.80%
NZ	1,178	938	911	79.63%	77.33%	97.12%
TW	13,741	3,276	3,203	23.84%	23.31%	97.77%
ZA	124	51	45	41.13%	36.29%	88.24%
total	97,373	64,464	62,190	66.20%	63.87%	96.47%

CDS tag numbers were readable in 66.2% of SBT observed through the Market Survey (total 97,343 individuals). The percentage of readable tag numbers ranged between Members from 23.84% to 79.77%.

This low “readable” rate is because, as described in Section 3-2) above, CDS tag numbers were not able to be recorded properly for a significant number of individuals observed at the Market Survey and could not be matched to the CTF data by CDS tag number. This may suggest that there is a problem with current way of attaching CDS tags by fishers and/or farm operators. As one of the important purposes of attaching CDS tag is to enable the identification of SBT individuals by unique tag number, this issue will be considered at the Technical Compliance Working Group in October 2021.

For some SBT individuals with incomplete CDS tag numbers, it was possible to deduce original CDS tag number from other information in the dataset. However, the Secretariat did not use the deduced tag numbers as it was not possible to confirm the deduced tag numbers were correct and there was a risk of further increasing the variability in the calculated values when integrating with the CTF data.

The matching rate of CDS tag numbers between the “readable” tag numbers from the Market Survey and CTF data greatly varied between Members, ranging from 23.31% to 77.33%. In particular, the matching rate for Korea (42.6%), Taiwan (23.31%) and South Africa (36.29%) were very low amongst Members.

On the other hand, the matching rate between “readable” tag numbers from the Market Survey and CTF data was very high in general, overall 96.47% and ranging 84.62% to 97.80% by Member. If data record/entry error rate occurred in the Market Survey was the same, this percentage may reflect Members “error rate” for CTF. Considering relatively low matching rate for Indonesia (84.62%) and South Africa (88.24%), data for these Members may not be suitable to conduct meaningful analysis.

From above integrated data after matching CDS tag number, the data used in this trial analysis were extracted and a new data set was created. The extracted data for the trial analysis are as follows:

- CDS tag numbers of matched SBT individuals
- Survey year in which SBT individuals were observed in Japanese market
- Product weights of SBT individuals observed/recorded in Japanese market
- Product type of individuals as recorded in the CDS
- Product weights of individuals as recorded in the CDS
- CCSBT Statistical Area in which SBT individuals were caught as recorded in the CDS

The difference between the product weights obtained from the two sources was calculated, then the mean and standard deviation of the proportion of difference between them were calculated for each stratum (Member, year, product type and CCSBT Statistical Area).

2) Coverage and representativeness of Japan’s Market Survey data against all SBT individuals

The Number of SBT individuals matched between Market Survey data and CTF data by Member and year is shown in Table 4.

Table 4: Number of individuals matched between Market Survey data and CTF data by Member and year. Figures in the cells indicate the number of individuals.

	AU	ID	JP	KR	NZ	TW	ZA	Total
2010*	-	10	944	58	-	204	-	1,216
2011*	-	73	2,097	501	87	427	-	3,185
2012*	-	158	2,340	557	39	142	8	3,244
2013*	5	79	2,243	1,009	19	241	3	3,599
2014*	8	130	3,547	857	54	440	-	5,036
2015*	89	34	5,047	675	141	503	-	6,489
2016*	-	-	6,160	735	27	408	-	7,330
2017*	-	-	6,567	793	5	475	-	7,840
2018*	-	-	7,258	806	-	353	-	8,417
2019*	227	-	8,016	3	370	5	20	8,641
2020*	217	-	6,777	11	169	5	14	7,193
Total	546	484	50,996	6,005	911	3,203	45	62,190

* Year code in Table 4 above is based on the date of Market Survey. Given the time lag between landing/importing and wholesale market auction, and also considering the fact that fishing season is varied between Members, the results of the calculations above should be

recognised as indicative, as some matching counts may be inherently more correct to be categorised in different years. The same caution should be applied to all tables and figures below in this document.

Table 4 shows that there is a very large variation in the number of matches between Members in each year.

In order to check the representativeness of Market Survey data against all CTF data, the number of matched SBT individuals (Table 4 above) was compared to the total number of CDS tags registered in the CTF by Member and year (Table 1 above). The calculated coverage of the Market Survey data against all CTF data is shown in Table 5 below.

Table 5. Coverage (percentage) of Number of matches to Market Survey data against the total number of CDS tag numbers registered with the CTF, by Member and year

	AU	ID	JP	KR	NZ	TW	ZA	Total
2010	0.00%	0.20%	2.45%	0.39%	0.00%	0.62%	0.00%	0.42%
2011	0.00%	0.61%	3.31%	3.77%	0.99%	2.82%	0.00%	0.97%
2012	0.00%	1.72%	4.57%	3.54%	0.29%	0.81%	0.82%	0.82%
2013	0.00%	0.43%	4.54%	5.16%	0.16%	0.72%	0.63%	0.87%
2014	0.00%	1.12%	6.03%	5.41%	0.39%	1.65%	0.00%	1.27%
2015	0.03%	0.57%	5.92%	3.07%	0.94%	1.52%	0.00%	1.40%
2016	0.00%	0.00%	7.67%	3.85%	0.14%	1.34%	0.00%	1.52%
2017	0.00%	0.00%	7.72%	4.32%	0.03%	1.45%	0.00%	1.77%
2018	0.00%	0.00%	6.81%	3.97%	0.00%	0.99%	0.00%	1.57%
2019	0.06%	0.00%	7.16%	0.01%	2.24%	0.01%	0.79%	1.54%
2020	0.06%	0.00%	7.44%	0.06%	1.10%	0.02%	1.07%	1.40%
Total	0.02%	0.42%	6.21%	3.03%	0.56%	1.00%	0.38%	1.29%

Based on Table 5 above, the overall coverage in recent years has been around 1.5% of coverage on a year by year basis. On a Member-by-Member basis, there has been a wide variation between Members in recent years, ranging from 0% to around 7%.

For Japan's SBT, the coverage for 2020 was 7.44% and the arithmetic mean coverage for the period 2010-2020 was 6.21%, which is quite high considering that the Market Survey has been conducted only twice a month.

On the other hand, only New Zealand (1.1%) and South Africa (1.07%) had a coverage over 1% in 2020, while the coverage for other Members was much lower.

Given the coverage indicated above, the Compliance Committee should consider carefully whether the data obtained from Market Survey is representative enough to be used in assessing the accuracy and identifying compliance trends in the CDS of all Members' stakeholders (mainly fishers and farming operators).

3) *Verification of reported catch by Members with CDS data and CDS tag survey data obtained from Japanese market*

Both the weight of SBT recorded in the Market Survey and in the CTF are product weight, and these weight data are directly comparable as there are unlikely to be any changes in product type between landing or export/import and auction.

As described in Section 4-1) above, the difference between the product weights of each individual SBT between the two data sets (Market Survey product weight minus CTF product weight) was calculated for each SBT individual and then the mean and standard deviation of the proportion of difference were calculated by Member. If this proportion is “zero”, it means the weight from Market Survey and the weight from CTF is the same and consequently Member’s reported weights were accurate. If this proportion is a negative figure, it indicates that the weight of the fish measured on the vessel or at the farm was higher than the weight measured in the market during the auction. For some Members, this may suggest that fishers on board may have weighed SBT “conservatively”, potentially to ensure that they do not exceed their quotas (e.g. if the measurement is 49.5kg, record as 50kg to CTF considering unstable weighing on board).

However, in the datasets used, very large discrepancies between the two weights data were observed for a considerable number of individuals.

To provide a visual representation of the variation in the data, a bubble plot showing the relationship between Market Survey weight and CTF weight by Member is provided at **Attachment A**. For all plots in **Attachment A**, the vertical axis is the CTF weight of each SBT individual and the horizontal axis is the Market Survey weight. Each bubble represents the counts of records within 5kg bin (i.e. the higher the count, the larger the bubble). In general, the Market Survey weight data and CTF weight data matched well (most bubbles are on/close to 1:1 line) for all Members, however there are large number of outliers, especially for Japan.

In addition, in order to indicate the scale of extreme records, the maximum weight discrepancies (in both positive and negative directions) between the two data sets by Member is shown in Table 6 below.

Table 6. Maximum discrepancy between Market Survey weight data and CTF weight data (positive and negative directions) by Member.

	AU		ID		JP		KR		NZ		TW		ZA		All	
	Plus	Minus	Plus	Minus	Plus	Minus	Plus	Minus	Plus	Minus	Plus	Minus	Plus	Minus	Plus	Minus
2010	0.00%	0.00%	4.00%	-63.19%	86.40%	-334.78%	55.79%	-94.44%	0.00%	0.00%	68.18%	-74.80%	0.00%	0.00%	86.40%	-334.78%
2011	0.00%	0.00%	71.88%	-93.99%	85.00%	-309.42%	58.20%	-181.55%	26.83%	-160.87%	54.00%	-148.12%	0.00%	0.00%	85.00%	-309.42%
2012	0.00%	0.00%	81.09%	-73.24%	88.89%	-821.88%	81.65%	-147.73%	29.69%	-93.01%	74.81%	-34.33%	2.53%	-0.88%	88.89%	-821.88%
2013	-0.79%	-1.38%	62.72%	-1189.47%	83.64%	-482.09%	84.00%	-930.00%	4.41%	-0.72%	69.51%	-78.57%	2.52%	1.35%	84.00%	-1189.47%
2014	-1.22%	-6.44%	69.61%	-46.55%	81.63%	-892.54%	71.43%	-900.00%	68.86%	-164.57%	61.98%	-122.22%	0.00%	0.00%	81.63%	-900.00%
2015	58.51%	-181.69%	5.11%	-8.59%	86.67%	-363.77%	58.50%	-891.60%	65.78%	-120.59%	76.74%	-176.19%	0.00%	0.00%	86.67%	-891.60%
2016	0.00%	0.00%	0.00%	0.00%	78.26%	-256.25%	63.16%	-117.39%	53.24%	-22.45%	85.04%	-358.33%	0.00%	0.00%	85.04%	-358.33%
2017	0.00%	0.00%	0.00%	0.00%	82.27%	-900.00%	65.65%	-220.69%	5.03%	-3.86%	75.66%	-169.46%	0.00%	0.00%	82.27%	-900.00%
2018	0.00%	0.00%	0.00%	0.00%	75.79%	-552.17%	42.17%	-909.71%	0.00%	0.00%	55.74%	-42.34%	0.00%	0.00%	75.79%	-909.71%
2019	3.58%	-115.28%	0.00%	0.00%	83.77%	-762.07%	14.06%	-1.75%	74.95%	-56.25%	58.20%	31.37%	32.69%	-23.46%	83.77%	-762.07%
2020	60.21%	-116.05%	0.00%	0.00%	86.37%	-380.39%	35.48%	-7.00%	70.35%	-219.54%	44.18%	-9.55%	26.32%	-28.81%	86.37%	-380.39%
All	60.21%	-181.69%	81.09%	-1189.47%	88.89%	-900.00%	84.00%	-930.00%	74.95%	-219.54%	85.04%	-358.33%	32.69%	-28.81%	88.89%	-1189.47%

As shown in Table 6 above, with positive deviations of up to 89% and negative deviations of up to minus 1189%, it is clear that this data set contains extreme outliers.

Besides, in order to indicate the distribution of the proportion of differences between the two weights data across all Members and year, a histogram is provided in Figure 1 below. In this histogram, The horizontal axis shows the proportion of difference between the weight data (interval 0.025 (2.5%)) and the vertical axis shows the number of SBT individuals.

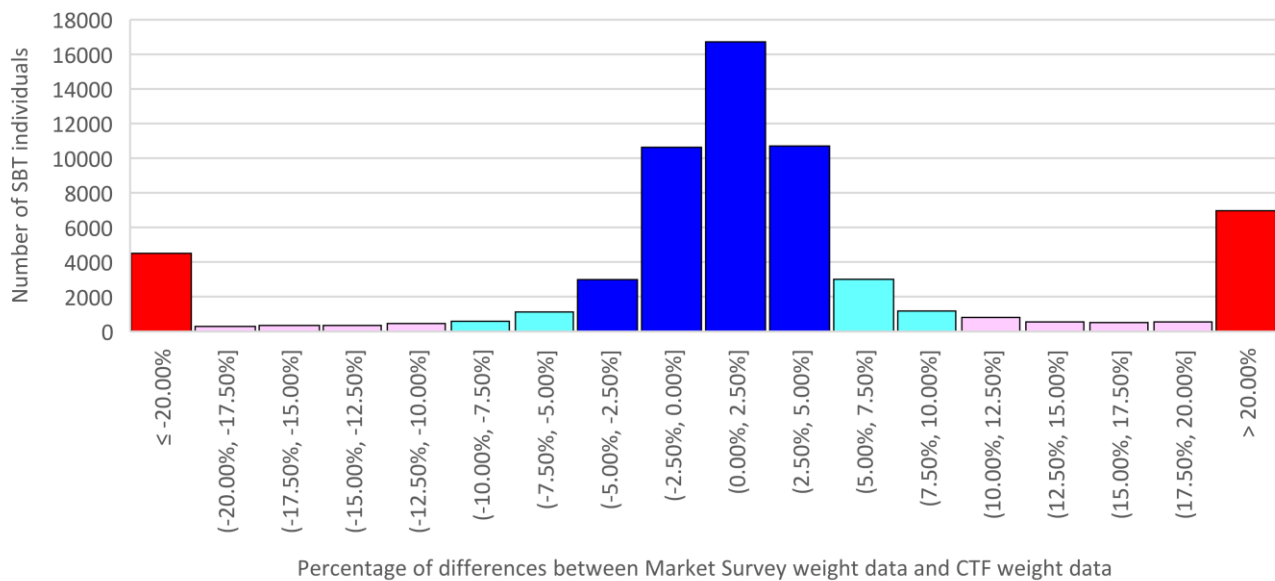


Figure 1: Histogram of the percentage of difference between the Market Survey weight data and CTF weight data. The horizontal axis shows the difference between the weight data (2.5% of interval) and the vertical axis shows the number of SBT individuals. The proportion of differences between the two weights data within $\pm 5\%$ are shown in blue, between $\pm 5\text{-}10\%$ in light blue, between $\pm 10\text{-}20\%$ in pink and above $\pm 20\%$ in red.

With regard to the difference between the weight weighed on board and the weight at landing in the CDS, taking into account the fact that Japan, Korea and Taiwan allow a range of $\pm 5\%$ between the weight weighed on board (the weight recorded in the CTF data) and landing weight as "error due to weighing on board", the SBT individuals with " $\pm 5\%$ " shown in blue in Figure 1 above can be considered as both the Market Survey data and the CTF data are properly recorded (within acceptable level under current CDS operation), and many of individuals are included in this category.

On the other hand, the number of SBTs with a difference of more than " $\pm 20\%$ " between the two weights data is more than 4,000 in the negative direction and about 7,000 in the positive direction, and such SBT individuals showed extreme figures, as shown in Table 6.

Such "extreme" records are appeared in both positive direction and negative direction (i.e. both "under-reported" and "over-reported" by fishers and/or farm operators). If fishers and/or farm operators were deliberately under-reporting to CTF not to exceed quotas, these extreme records should be unevenly distributed on the positive direction. Considering relatively "even" distribution of records to both positive and negative directions, it would be appropriate to consider that large part of such extreme records were un-intentional errors due to administrative problems (e.g. mis-writing or mis-entering data by surveyer while Japan's Market Survey, or data error in CTF database etc.) and may be appropriate to deem these extreme records as "outliers".

If such outliers are excluded, it can be qualitatively stated that the catches reported by Members are reasonably accurate (i.e. within the margin of error allowed by the current CDS operation), as many SBT individuals are fallen within the $\pm 5\%$ range.

However, it is difficult to quantitatively determine the accuracy of the catches reported by Members, as there are large number of extreme figures and currently no defined criteria for determining such extreme figures as outlier.

5. Additional Trial Analysis using the same dataset

The data set used for Section 4 above contains several components that allow for analysis focusing on different elements, such as by Member, by product type and by CCSBT Statistical Area.

On the other hand, as noted in section 4-3) above, it is highly likely that a simple calculation of the mean from all the data would not lead to a true value due to the influence of outliers. Having said that, as a trial, the Secretariat carried out some additional analyses using the full dataset, rather than remove outliers arbitrary, to provide the Compliance Committee an idea of how this data could be used.

1) Comparison of product weights between Japan's Market Survey data and CTF data – by Member

The number of matched SBT individuals between Market Survey data and CTF data by Member and year shown in Table 4 above.

The percentage and standard deviations of the differences between Market Survey weight data and CTF weight data by Member and year are shown in Table 7. As mentioned in section 4-3), negative values may indicate a positive sign in terms of compliance, indicating that fishers and/or farm operators are weighing conservatively on site, i.e. they tend to be more careful not to exceed their quota.

Table 7: Percentage and standard deviation of differences between Market Survey weight data and CTF weight data by Member and year. Figures in brackets indicate standard deviations. Cells with negative figure are highlighted in light blue.

	AU		ID		JP		KR		NZ		TW		ZA		All	
2010	NA	(NA)	-5.88%	(20.28%)	-0.76%	(27.50%)	-4.12%	(22.92%)	NA	(NA)	1.18%	(12.93%)	NA	(NA)	-0.64%	(25.38%)
2011	NA	(NA)	-2.38%	(24.55%)	1.28%	(26.87%)	-3.09%	(12.74%)	-1.21%	(20.34%)	-0.93%	(11.46%)	NA	(NA)	0.14%	(23.36%)
2012	NA	(NA)	-1.99%	(14.06%)	-3.59%	(50.93%)	-1.15%	(12.06%)	0.35%	(16.53%)	0.68%	(8.89%)	0.92%	(1.25%)	-2.85%	(43.75%)
2013	-0.98%	(0.25%)	-13.30%	(134.44%)	4.64%	(30.52%)	-1.77%	(42.54%)	1.06%	(1.16%)	0.45%	(13.94%)	1.89%	(0.59%)	2.14%	(38.80%)
2014	-3.17%	(1.78%)	-4.25%	(12.84%)	2.21%	(29.37%)	-1.38%	(33.15%)	3.74%	(29.37%)	-0.15%	(13.17%)	NA	(NA)	1.23%	(28.74%)
2015	-0.84%	(23.24%)	-3.48%	(2.46%)	2.28%	(24.62%)	-1.52%	(35.19%)	1.85%	(14.79%)	-1.55%	(16.66%)	NA	(NA)	1.50%	(25.22%)
2016	NA	(NA)	NA	(NA)	0.69%	(25.24%)	-1.98%	(9.26%)	2.77%	(11.27%)	0.07%	(20.92%)	NA	(NA)	0.40%	(23.86%)
2017	NA	(NA)	NA	(NA)	0.36%	(31.27%)	-2.32%	(11.71%)	0.01%	(3.27%)	1.15%	(12.61%)	NA	(NA)	0.14%	(29.04%)
2018	NA	(NA)	NA	(NA)	0.78%	(24.13%)	-2.10%	(32.55%)	NA	(NA)	0.22%	(9.72%)	NA	(NA)	0.48%	(24.66%)
2019	-1.62%	(8.75%)	NA	(NA)	0.10%	(42.94%)	3.79%	(8.90%)	1.91%	(13.69%)	44.71%	(10.11%)	-8.75%	(10.70%)	0.14%	(41.50%)
2020	0.23%	(10.90%)	NA	(NA)	2.38%	(32.57%)	2.40%	(11.98%)	-1.26%	(25.32%)	7.04%	(21.78%)	5.67%	(15.87%)	2.24%	(31.93%)
All	-0.77%	(12.92%)	-4.69%	(56.04%)	1.03%	(32.29%)	-1.89%	(28.33%)	1.05%	(18.30%)	0.04%	(14.41%)	-1.84%	(12.89%)	0.64%	(31.22%)

Australia, Indonesia, and Korea showed negative calculated values for almost the whole period 2010-2020, suggesting that these operators may roundup measurements on board to reduce the chance of exports being questioned (for under-estimation of weight) or to be conservative with respect to quota usage.

Japan, New Zealand and Taiwan showed positive values for the most years from 2010-2020. However, based on the fact that most of the average values by Members/years are within the "±5%" range described above, it may be interpreted that fishers and/or farm operators in all Members are making accurate reporting of SBT weights through CTFs.

However, the standard deviation is very large for all Members and years, and there are very few cells where the standard deviation is within the range of ±5%. In addition, in some cells where the calculation results are close to zero (zero means that the Market Survey weight and the CTF weight are exactly the same), the number of matches between the Market Survey data and the CTF data is very small, making the representativeness of the results for assessing the whole questionable. Furthermore, the number of samples in

each cell varies greatly, and consequently any decision based on the above results should be considered with extreme caution.

2) *Comparison of product weights between Japan's Market Survey data and CTF data – by Product type*

The number of SBT individuals matched between the Market survey data and CTF data by product type and year is shown in Table 8 below. The product types defined by the CDS Resolution that appear in this dataset are as follows:

- GG: Gilled and gutted
- GGO: Gilled and gutted – Tail on
- GGT: Gilled and gutted – Tail off

Table 8: Product types in CTF data for SBT individuals matched to Market Survey data (2010-2020). Figures in the cells indicate the number of individuals.

	GG	GGO	GGT	Total
2010	1,216	-	-	1,216
2011	3,185	-	-	3,185
2012	3,225	-	19	3,244
2013	1,863	68	1,668	3,599
2014	203	92	4,741	5,036
2015	99	31	6,359	6,489
2016	5	-	7,325	7,330
2017	62	-	7,778	7,840
2018	-	-	8,417	8,417
2019	-	348	8,293	8,641
2020	-	237	6,956	7,193
Total	9,858	776	51,556	62,190

As one of the product types defined in the original 2010 CDS Resolution was "GG", almost all SBTs for the period 2010-2012 were recorded as "GG". In October 2012, the CCSBT revised its CDS resolution and the definition of "GG" was subdivided into "GGO" and "GGT". As a result of this revision to the CDS Resolution, SBT individuals from 2013 onwards were recorded as either GGO or GGT. As Table 8 shows, in recent years the product type of most Members has been GGT, although some Members have continued to process and export SBT as GGO in recent years (likely to be the case with Members exporting fresh SBT).

The percentage and standard deviations of the differences between Market Survey weight data and CTF weight data by product type and year are shown in Table 9.

Table 9: Percentage and standard deviation of differences between Market Survey weight data and CTF weight data by product type and year. Figures in brackets indicate standard deviations. Cells with negative figure are highlighted in light blue.

	GG	GGO	GGT	All
2010	-0.64% (25.38%)	NA (NA)	NA (NA)	-0.64% (25.38%)
2011	0.14% (23.36%)	NA (NA)	NA (NA)	0.14% (23.36%)
2012	-2.88% (43.87%)	NA (NA)	3.05% (3.07%)	-2.85% (43.75%)
2013	3.25% (44.36%)	-16.11% (144.66%)	1.64% (14.00%)	2.14% (38.80%)
2014	-3.27% (27.09%)	-0.87% (12.03%)	1.47% (29.02%)	1.23% (28.74%)
2015	-0.20% (23.36%)	-3.65% (2.43%)	1.56% (25.30%)	1.50% (25.22%)
2016	-1.42% (1.89%)	NA (NA)	0.40% (23.87%)	0.40% (23.86%)
2017	36.60% (29.63%)	NA (NA)	-0.15% (28.85%)	0.14% (29.04%)
2018	NA (NA)	NA (NA)	0.48% (24.66%)	0.48% (24.66%)
2019	NA (NA)	-1.05% (8.84%)	0.19% (42.32%)	0.14% (41.50%)
2020	NA (NA)	-1.48% (22.54%)	2.36% (32.19%)	2.24% (31.93%)
All	-0.20% (36.00%)	-2.58% (45.10%)	0.84% (29.95%)	0.64% (31.22%)

Although there is a large difference in sample size between GGO and GGT as shown in Table 8, Table 9 shows that the calculated values are all negative for GGO and generally positive for GGT. This could potentially be interpreted as a tendency to weigh fish conservatively among fishers and/or farm operators who land and process SBT as GGO. If this is true, the product type could be used as an indicator to select fishers and/or farm operators when managers need to narrow targets for monitoring and guidance from the perspective of compliance with CDS requirements.

However, as repeatedly pointed out above, the interpretation of the results presented in this document should be conducted with extreme caution, as the dataset used in this analysis contains a large number of outliers and all calculations, including averages and standard deviations, are subject to a large degree of uncertainty, and any figures presented here should not be used for comparison with data from other studies or analyses.

3) *Comparison of product weights between Japan's Market Survey data and CTF data – by CCSBT Statistical Area*

The CCSBT Statistical Areas adopted by the CCSBT and used as the basis for the spatial aggregation of various CCSBT data (for both scientific and compliance purpose) are shown in **Attachment B**.

The CTF data contains information on the CCSBT Statistical Areas in which the SBT concerned were fished, and the information on the SBT in this dataset can be aggregated to the CCSBT Statistical Areas.

The number of matched SBT individuals between Market Survey data and CTF data by Statistical Area is shown in Table 10 below.

Table 10: Number of matched SBT individuals between Market Survey data and CTF data by CCSBT Statistical Area (2010-2020). Figures in the cells indicate the number of matched individuals.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Un-known	Total
2010*	-	172	-	157	-	-	202	74	580	-	-	-	-	31	-	-	1,216
2011*	-	314	-	102	2	87	791	482	1,342	-	-	-	-	61	4	-	3,185
2012*	4	116	-	101	2	38	713	659	1,563	-	-	-	-	40	8	-	3,244
2013*	-	232	5	147	-	19	805	553	1,796	11	-	1	-	30	-	-	3,599
2014*	3	417	8	230	10	53	1,561	628	1,987	-	2	-	-	133	4	-	5,036
2015*	-	360	89	314	-	141	2,040	670	2,768	-	-	-	-	107	-	-	6,489
2016*	1	307	-	393	4	27	2,077	888	3,464	-	-	13	-	154	2	-	7,330
2017*	-	395	-	351	2	5	2,244	637	4,072	-	-	4	-	129	1	-	7,840
2018*	-	180	-	611	-	-	3,054	347	4,099	-	-	-	-	120	6	-	8,417
2019*	-	167	25	1,046	195	161	3,216	294	3,522	-	-	-	-	-	15	-	8,641
2020*	-	49	3	462	112	72	2,580	280	3,612	-	-	-	-	1	8	14	7,193
Total	8	2,709	130	3,914	327	603	19,283	5,512	28,805	11	2	18	-	806	48	14	62,190

The percentage and standard deviations of the differences between Market Survey weight data and CTF weight data by CCSBT Statistical Area are shown in Table 11.

Table 11: Percentage and standard deviation of differences between Market Survey weight data and CTF weight data by CCSBT Statistical Area and year. Figures in brackets indicate standard deviations. Cells with negative figure are highlighted in light blue.

	1		2		3		4		5		6		7		8	
2010	NA	(NA)	1.07%	(11.78%)	NA	(NA)	3.39%	(5.65%)	NA	(NA)	NA	(NA)	-3.90%	(26.94%)	0.60%	(23.49%)
2011	NA	(NA)	-1.16%	(15.90%)	NA	(NA)	2.74%	(15.95%)	0.02%	(1.33%)	-1.21%	(20.34%)	2.56%	(15.50%)	-1.19%	(17.10%)
2012	-8.58%	(7.27%)	1.33%	(17.31%)	NA	(NA)	3.73%	(33.80%)	-90.86%	(155.72%)	-0.15%	(16.45%)	-6.12%	(44.46%)	-7.41%	(46.25%)
2013	NA	(NA)	-3.02%	(79.53%)	-0.98%	(0.25%)	3.14%	(16.42%)	NA	(NA)	1.06%	(1.16%)	4.04%	(20.66%)	-7.33%	(62.05%)
2014	2.17%	(3.03%)	-3.04%	(47.15%)	-3.17%	(1.78%)	2.60%	(18.16%)	8.56%	(21.21%)	2.51%	(28.22%)	5.65%	(17.18%)	-7.05%	(39.13%)
2015	NA	(NA)	-1.28%	(20.83%)	-0.84%	(23.24%)	2.56%	(18.41%)	NA	(NA)	1.85%	(14.79%)	3.28%	(19.21%)	-7.92%	(50.31%)
2016	-13.43%	x	4.76%	(16.44%)	NA	(NA)	2.20%	(18.95%)	-13.93%	(29.46%)	2.77%	(11.27%)	2.32%	(19.48%)	-9.24%	(40.69%)
2017	NA	(NA)	1.67%	(15.05%)	NA	(NA)	1.92%	(10.32%)	3.80%	(0.89%)	0.01%	(3.27%)	3.07%	(27.16%)	-23.85%	(57.07%)
2018	NA	(NA)	4.89%	(17.98%)	NA	(NA)	1.43%	(14.01%)	NA	(NA)	0.00%	(0.00%)	1.95%	(22.71%)	-17.77%	(59.91%)
2019	NA	(NA)	32.88%	(22.12%)	-0.79%	(0.43%)	0.61%	(9.76%)	0.40%	(9.61%)	3.71%	(17.41%)	2.71%	(39.17%)	-47.38%	(103.24%)
2020	NA	(NA)	-29.53%	(48.98%)	-71.45%	(69.33%)	0.08%	(14.62%)	0.79%	(9.35%)	2.42%	(9.92%)	4.30%	(27.52%)	-14.92%	(51.47%)
All	-5.16%	(8.05%)	1.69%	(35.12%)	-2.61%	(23.59%)	1.57%	(14.88%)	0.07%	(15.34%)	1.91%	(17.20%)	2.75%	(27.22%)	-12.13%	(53.22%)

Cont.	9		10		11		12		13		14		15		Unknown	
2010	-1.29%	(31.10%)	NA	(NA)	NA	(NA)	NA	(NA)	NA	(NA)	-0.08%	(8.36%)	NA	(NA)	NA	(NA)
2011	-0.49%	(30.42%)	NA	(NA)	NA	(NA)	NA	(NA)	NA	(NA)	-1.97%	(17.61%)	-3.88%	(3.66%)	NA	(NA)
2012	-0.39%	(44.76%)	NA	(NA)	NA	(NA)	NA	(NA)	NA	(NA)	8.13%	(22.93%)	-1.04%	(2.18%)	NA	(NA)
2013	4.78%	(27.50%)	2.50%	(1.96%)	NA	(NA)	-3.96%	x	NA	(NA)	4.09%	(25.81%)	NA	(NA)	NA	(NA)
2014	1.17%	(28.19%)	NA	(NA)	-3.81%	(0.67%)	NA	(NA)	NA	(NA)	-0.10%	(15.19%)	-2.81%	(4.61%)	NA	(NA)
2015	3.06%	(20.53%)	NA	(NA)	NA	(NA)	NA	(NA)	NA	(NA)	-5.81%	(29.30%)	NA	(NA)	NA	(NA)
2016	1.14%	(20.38%)	NA	(NA)	NA	(NA)	0.16%	(1.69%)	NA	(NA)	0.11%	(31.01%)	0.00%	(3.45%)	NA	(NA)
2017	1.96%	(23.98%)	NA	(NA)	NA	(NA)	1.08%	(30.97%)	NA	(NA)	0.74%	(10.39%)	-1.33%	x	NA	(NA)
2018	0.60%	(21.98%)	NA	(NA)	NA	(NA)	NA	(NA)	NA	(NA)	0.48%	(12.48%)	0.45%	(2.15%)	NA	(NA)
2019	-0.05%	(40.27%)	NA	(NA)	NA	(NA)	NA	(NA)	NA	(NA)	NA	(NA)	-10.40%	(4.77%)	NA	(NA)
2020	2.89%	(34.24%)	NA	(NA)	NA	(NA)	NA	(NA)	NA	(NA)	0.00%	x	7.16%	(19.33%)	2.24%	(1.02%)
All	1.46%	(29.34%)	2.50%	(1.96%)	-3.81%	(0.67%)	0.13%	(13.13%)	NA	(NA)	-0.18%	(21.40%)	-2.76%	(10.19%)	2.24%	(1.02%)

As shown in Table 10 and 11 above, very little data is available for Statistical Areas 1, 3, 5, 10-13 and 15.

Overall, of Statistical Areas for which some data are available, Statistical Area 4, 6, 7 and 9 are dominated by positive values.

On the other hand, Area 8 showed stable negative values. This could be due to a tendency to weigh fish conservatively among fishers and/or farm operators who are operating in Statistical Area 8 (mainly Japan and Taiwan's fleets are operating recent years). If this is true, CCSBT Statistical Area could be used as an indicator to select Member, domestic fishers and/or farm operators when the Commission or Members' managers need to

narrow targets for monitoring and guidance from the perspective of compliance with CDS requirements.

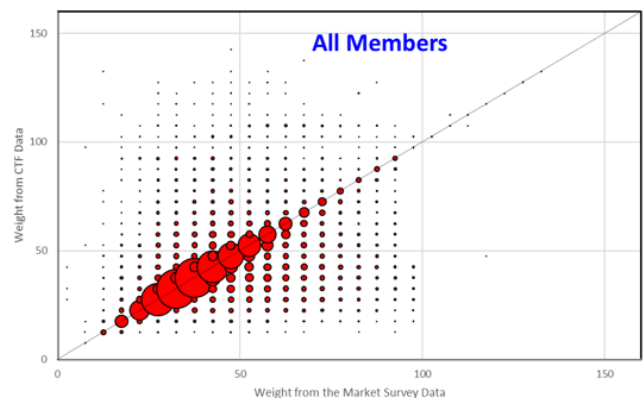
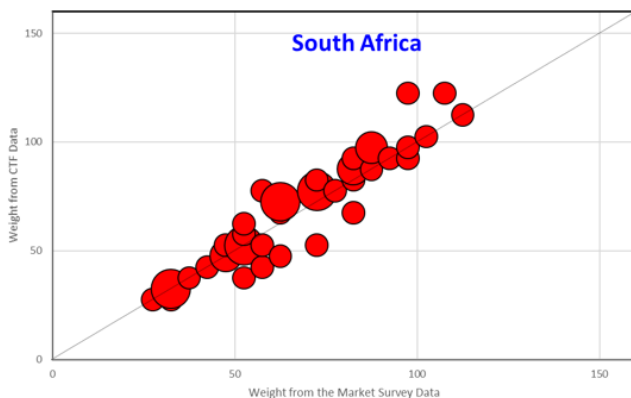
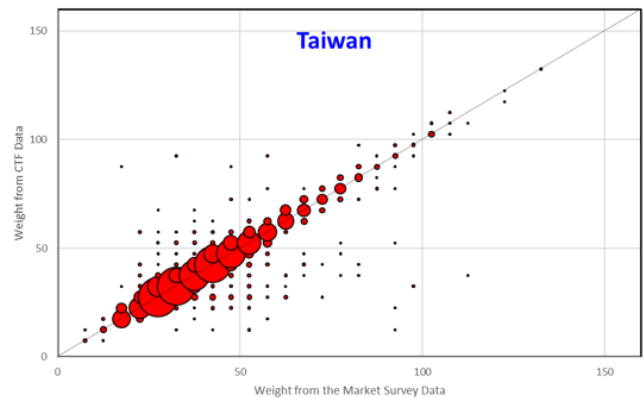
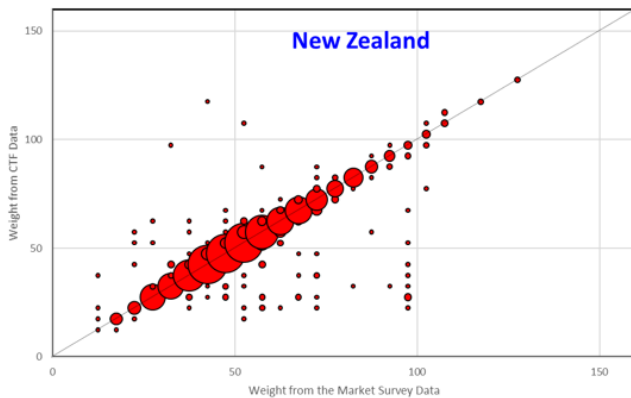
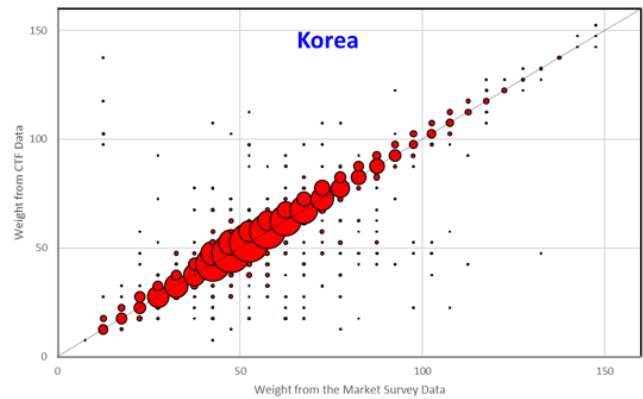
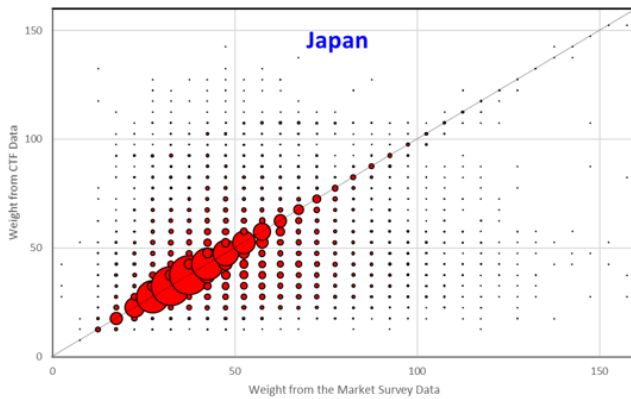
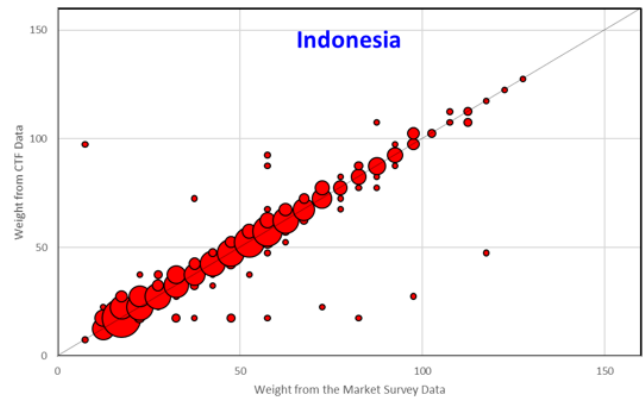
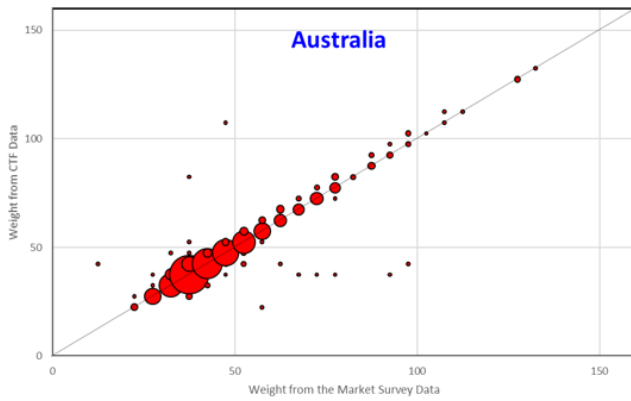
However, as repeatedly pointed out above, the interpretation of the results presented in this document should be done with extreme caution, as the dataset used in this analysis contains a large number of outliers and all calculations, including averages and standard deviations, are subject to a large degree of uncertainty, and any figures presented here should not be used for comparison with data from other studies or analyses.

6. Conclusion

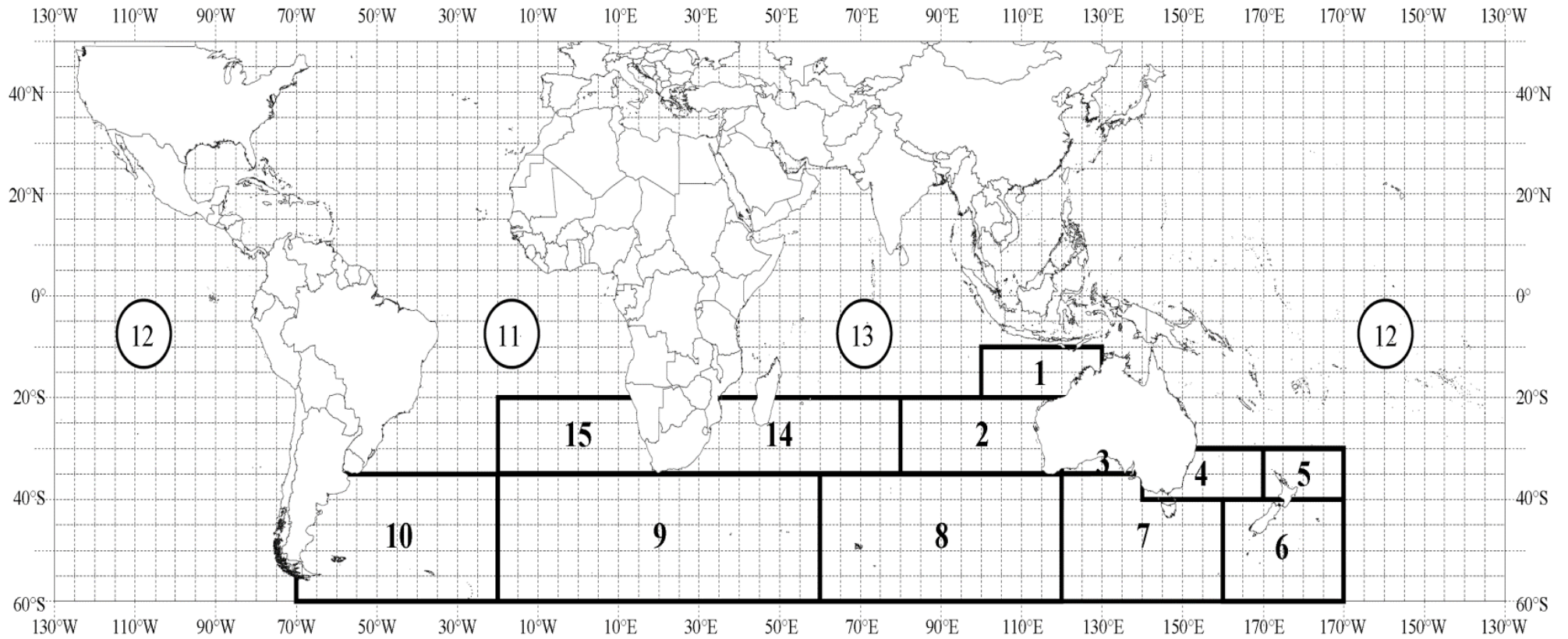
- (1) The results of the trial analysis carried out in this document and additional comment are summarised below.
 - The Market Survey data provided by Japan and the CTF data held by the Secretariat (2010-2020) were cross-verified. Overall, there was a high (94.67%) matching of readable tag numbers in the market data against the CTF tag data. This suggests that the large weight discrepancies observed were not a result of incorrectly matched fish.
 - The coverage of Japan's Market Survey data against all CTF data is around or less than 1% for most Members, with the exception of Japan, which shows a relatively high coverage (around 7% in recent years). As a precondition for discussion, it is necessary to consider that whether the data obtained from the Japan's Market Survey can be regarded as sufficiently representative of each Member's SBT, to enable it to be used as a basis of assessment by the Compliance Committee.
 - There were significant discrepancies in product weight data between the Market Survey data and the CTF data for a significant number of SBT individuals, making significant calculations and visualisations using the whole data difficult. In this trial analysis, all data with matching CDS tag numbers between the Market Survey and CTF data were used, but it should be determined whether outliers should be excluded from the analysis and, if so, what the criteria for such exclusion should be.
 - If the analysis were to deem outliers of more than $\pm 20\%$ in the weight data as being due to administrative error etc., it could be qualitatively stated that the catches reported by Members through the CTF are reasonably accurate, as most of the matched SBT individuals fall within the range of $\pm 5\%$ difference. However, it is difficult to make a quantitative analysis as there are no criteria for determining an outlier.
 - The results of the additional comparison suggested some elements that may serve as indicators for the Commission and/or Members to target monitoring and guidance in terms of compliance with CDS requirements (i.e. which Members, which product types, and which Statistical Areas fishers and/or farm operators tend to over-report or under-report the weight of fish). However, due to the problems of representativeness and data errors pointed out in 4.2) and 4-3) above, the results obtained in this analysis should be interpreted with extreme caution and any figures should not be used for comparison with those obtained from other studies or analyses.
 - It should be noted that the twice-monthly Japanese Market Survey that Japan has been conducted independently to obtain Japan's Market Survey data is proposed to be funded by CCSBT in future.
- (2) The Compliance Committee is invited to:
 - Review the result of this trial analysis for verification of reported catch by Members with CDS data and CDS tag survey data obtained from Japanese market and consider whether or not this analysis, with the high error rate observed, is useful for CC's assessment and discussion;

- Decide whether this analysis should be carried out again next year; and
- If so, make clear recommendations to the Secretariat on what needs to be included for the next analysis.

Attachment A



Comparison between weight data from the Market Survey (kg, horizontal axis) and from CTF data (kg, vertical axis). Each bubble in the bubble plot represents the number of records within 5kg bin (i.e. the higher the count, the larger the bubble). Black dotted line indicates 1:1. Note: the scale of bubble size is not the same between graphs as it is relative to total sample size for each Member.



CCSBT Statistical Area (extracted from Appendix 1 of the CCSBT CDS resolution).