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Report on Project 60: Collection and Evaluation of Purse-Seine Species Composition Data

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Report for the WCPFC Consultancy on the Collection and Evaluation of Purse-Seine Species Composition Data, February 2012 — July 2012

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Introduction

A consultancy agreement was established between the Western and Central Pacific Fisheries Commission and the Secretariat of the Pacific Community in April 2009 for a project on the collection and evaluation of purse-seine species composition data. The objective of the project is to improve the collection and representative nature of species composition data caught by purse-seine fisheries in the WCPO in order to improve the stock assessments of key target species in the WCPO. The initial duration of the project was from 1 April 2009 to 31 January 2010. The project was extended to the period from 1 April 2010 to 31 January 2011, then to the period from 1 February 2011 to 31 January 2012, and then to the period from 1 February 2012 to 31 July 2012. This report is intended to satisfy the requirement under the Terms of Reference that a report for the current period shall be submitted to the Commission by 30 July 2012.

Scope

The scope of work under the project includes the following:

a. Continue to identify key sources of sampling bias in the manner in which species composition data are currently collected from WCPO purse seine fisheries and investigate how such biases can be reduced

b. Review a broad range of sampling schemes at sea as well as onshore; develop appropriate sampling designs to obtain unbiased species composition data by evaluating the selected sampling procedures; extend sampling to include fleets, areas and set types where no representative sampling has taken place; verify, where possible, the results of the paired sampling against cannery, unloading and port sampling data

c. Review current stock assessment input data in relation to purse-seine species composition and investigate any other areas to be improved in species composition data, including collaborations with other RFMOs

d. Document a standard spill sampling methodology.

During the period from 1 April 2009 to 31 July 2012, the following activities were undertaken:

Scope (a)

- During the April 2009 – January 2010 period, a study entitled "Selectivity bias in grab samples and other factors affecting the analysis of species composition data collected by observers on purse seiners in the Western and Central Pacific Ocean" was completed. Size selectivity bias in grab samples taken by observers was estimated using data collected from paired grab and spill samples during four trips on purse seiners fishing anchored FADs in Papua New Guinea during 2008.

During the April 2010 – January 2011 period, the study was extended with data from a total of 17 purse-seine trips during which paired grab and spill sampling took place (Table 1, Figure 1). The study was presented at the Sixth Regular Session of the WCPFC Scientific Committee, 10–19 August 2010, Nuku'alofa, Tonga, in a working paper entitled "Update on the estimation of selectivity bias based on paired spill and grab samples collected by observers on purse seiners in the Western and Central Pacific Ocean."

During the February 2011 – January 2012 period, historical grab samples corrected for selectivity bias were used to generate purse-seine length frequencies. The study was presented at the Seventh Regular Session of the WCPFC Scientific Committee, 9–17 August 2011, Pohnpei, Federated States of Micronesia, in an information paper entitled "Purse-Seine Length Frequencies Corrected for Selectivity Bias in Grab Samples Collected by Observers."

During the current reporting period, February 2012 – July 2012, additional analyses on sampling bias were undertaken:

(a) the estimation of selectivity bias using splines was developed and applied to paired grab and spill sampling data covering 23 trips;

(b) the effect of layering by size during brailing on the selectivity bias was examined;

(c) historical grab samples were corrected with new estimates of the selectivity bias;

(d) a model-based approach to estimate the species composition of purse-seine catches from grab samples corrected for selectivity bias and spill samples was further developed; and

(e) the catches determined from the model-based estimates of the species composition were used to scale purse-seine length frequencies.

The results of these analyses, and additional work, will be presented at the Eighth Regular Session of the WCPFC Scientific Committee, 7–15 August 2012, Busan, Korea, in a working paper entitled "Estimation of the species composition of the catch by purse seiners in the Western and Central Pacific Ocean using grab samples and spill samples collected by observers."

Scope (b)

- Table 1 and Figure 1 summarises the 23 successful trips for which paired sampling data are currently available. An additional 7 trips have been completed successfully during March – July 2012 and the data will be available in due course. Table 2 shows the target number of paired sampling trips determined at the Fifth Regular Session of the WCPFC Scientific Committee for each flag state or group of states, and the numbers of successful and unsuccessful trips completed as of July 2012.

  The Data Collection Officer (DCO) was recruited by the OFP, with funding from New Zealand, in July 2011. He has been particularly effective in implementing the paired sampling trips, with 12 trips completed and one trip ongoing at the time of writing. Additional trips will be organised on a regular basis during the remainder of 2012 and, pending funding of the spill sample observers, in 2013.

The DCO also implemented a project in the Solomon Islands, in conjunction with National Fisheries Development Ltd, to compare species compositions determined from (i) logsheets, (ii) grab samples, (iii) spill samples, (iv) cannery receipts and (v) port samples of species and size categories landed at the cannery in Noro, Solomon Islands. The first paired sampling trip was taken on the *Solomon Ruby* from 27 November to 13 December 2011, with port sampling on 14–15 December 2011. A total of ten trips will be undertaken by early 2013. The data from the first trip were analysed in January 2012; see Appendix I for an analysis of the data.

The DCO also initiated discussions with RD Fishing of Papua New Guinea regarding the fabrication and purchase of multiple spill sample bins. The bins will be placed in ports such as Honiara, Madang, Majuro and Pohnpei for use in future paired sampling trips.

- In May 2012, he also participated in a trip on a purse seiner chartered by the International Seafood Sustainability Foundation (ISSF), the *Cape Finisterre*, during which he collected further spill sampling data and evaluated video monitoring of the catch. See Appendix II for his analysis of the capacity of spill sampling bins based on the ISSF trip.

- Trials of the motion-compensated scale purchased previously were further delayed due to lack of manpower resources. However, the DCO is currently organising trials of the motion-compensated scale in the Solomon Islands for later in 2012.

Scope (c)

- In July 2012, estimation of purse-seine catches by species and size composition were adjusted with observer grab samples, 1993–2011, corrected for size selectivity bias estimated using splines (Figure 2 and 3). Three model-based approaches to estimating the species composition were applied. Length-frequency data were also adjusted and scaled by the catch (Figure 4). The estimates will be further updated as additional catch data and paired sampling data become available.

- No further collaboration with other RMFOs in regard to purse-seine species composition took place during the current reporting period.

Scope (d)

- Documentation of the spill sampling protocol is presented in Appendix III. Further consideration will be given to the dimensions of the spill sampling bin, so the dimensions of the bin in Appendix III have been bracketed.

Conclusion and Future Work

Regarding scope (a), during the current reporting period, the grab sample selectivity bias for large fish was estimated from recent paired sampling data on unassociated schools. However, the estimates (Figure 3) for large fish are imprecise and additional samples of large fish are required. Funding is currently available to conduct additional paired sampling trips through the end of 2012, but additional funds will be required to conduct trips in 2013.

Regarding scope (b), the recruitment of the Data Collection Officer has greatly facilitated the organisation of paired sampling trips and the comparison of spill and grab samples to the port sampling of landing categories at the Noro cannery. He will continue this work until his contract terminates in June 2013.

Regarding scope (c), both the catch data and length frequencies used in the tuna stock assessments were adjusted with grab samples that had been corrected with estimates of selectivity bias. Additional analyses will include (a) examination of the use of grab samples corrected for selectivity bias in estimating species composition at finer levels of resolution and (b) further development of techniques for determining the species composition for strata for which observer data are missing.

In summary, considerable progress was achieved during the reporting period. There were ten successful paired sampling trips undertaken and one trip is underway. Additional trips are currently being organised. The Noro project was implemented, with one paired sampling trip carried out followed by port sampling of landing categories, and the data have been analysed. Additional trips under the Noro project will be undertaken in due course.

Funds are available to continue paired sampling trips and the work at Noro through the end of 2012; however, additional funds will be required to extend this work in 2013.

Table 1. Date, location, catch and number of sets sampled for trips during which paired grab and spill samples were collected

Trip #	Date		Latitude		Longitude		Sampled Catch (Tonnes)	Number of Sets					
	Min	Max	Min	Max	Min	Max		Total	Anchored FADs	Drifting FADs	Logs	Unassoc	Other
1	23-Mar-08	27-Mar-2008	03S	01S	143E	146E	452	7	0	0	0	0	7
2	09-Jun-08	30-Jun-08	04S	00N	143E	149E	580	13	10	1	0	0	2
3	21-Jun-08	08-Aug-08	03S	00N	141E	150E	1,172	31	30	0	1	0	0
4	14-Jul-08	09-Aug-08	03S	02S	141E	146E	616	15	9	4	1	0	1
5	03-May-09	05-Jun-09	04S	02S	148E	151E	469	15	13	0	1	1	0
6	04-May-09	04-Jun-09	02S	01S	143E	146E	256	9	8	0	0	0	1
7	04-Jun-09	19-Jul-09	05S	02S	142E	151E	613	23	20	1	2	0	0
8	15-Jun-09	18-Jul-09	04S	01S	144E	148E	335	13	9	0	4	0	0
9	16-Jun-09	26-Jul-09	05S	02S	142E	150E	352	22	17	0	5	0	0
10	22-Aug-09	10-Sep-09	04S	04S	150E	151E	317	16	10	1	4	0	1
11	27-Sep-09	10-Oct-09	05S	02S	143E	150E	518	10	7	0	3	0	0
12	09-Oct-09	21-Oct-09	02S	02S	143E	144E	541	8	4	0	4	0	0
13	03-Nov-09	01-Dec-09	03S	01S	143E	146E	514	15	12	0	3	0	0
14	11-Nov-09	04-Dec-09	03S	02S	143E	146E	388	14	13	0	0	0	1
15	13-Nov-09	07-Dec-09	03S	02S	142E	142E	460	15	15	0	0	0	0
16	19-Mar-10	16-Apr-10	04S	00N	146E	165E	749	20	0	10	0	9	1
17	30-Apr-10	07-May-10	00N	01N	152E	154E	343	8	0	7	0	1	0
18	10-Dec-10	06-Jan-11	06S	01S	152E	160E	866	21	0	2	0	16	3
19	28-Nov-11	12-Dec-11	09S	08S	158E	159E	240	10	10	0	0	0	0
20	19-Jan-12	21-Feb-12	08S	02N	145E	162E	811	16	0	1	0	15	0
21	07-Feb-12	18-Feb-12	01N	02N	144E	150E	1,036	12	0	0	0	12	0
22	09-Mar-12	13-Apr-12	00N	02N	144E	155E	1,047	22	0	0	3	19	0
23	11-Mar-12	19-Apr-12	06S	02N	148E	161E	911	13	0	3	0	9	1
						Total	13,587	348	187	30	31	82	18

Table 2. Target number of paired sampling trips determined at the Fifth Regular Session of the WCPFC Scientific Committee and the numbers of successful and unsuccessful trips completed as of July 2012

Vessel Nationality / Arrangement	Target Number of Trips	Trips as of July 2012	
		Successful	Unsuccessful
FSM Arrangement	8	16	
China	2		
Japan	6	3	
Korea	8	2	4
New Zealand	2		4
Philippines	2		
Solomon Islands	2	2	
Chinese Taipei	8	1	2
United States of America	8	3	2
Vanuatu	2	3	
EU and EPO-based fleets	2		
TOTAL	50	30	12

Figure 1. Location of sets from which paired spill and grab samples were collected

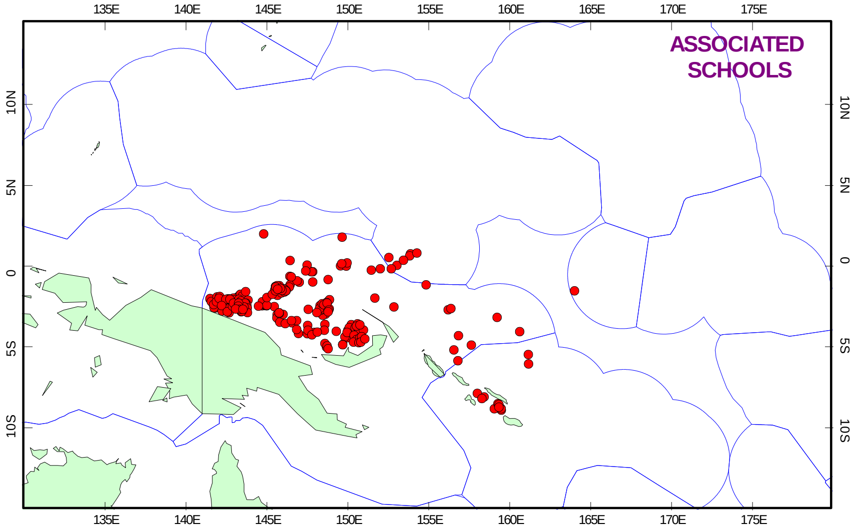


Figure 1 (continued)

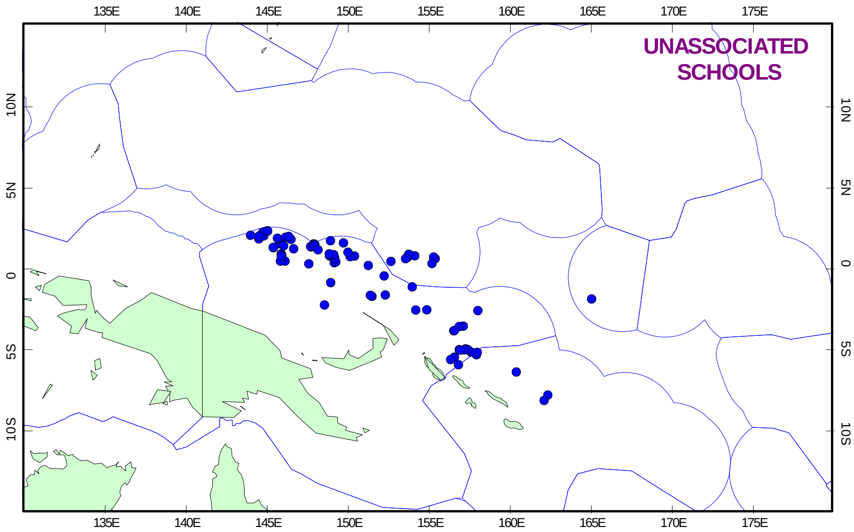


Figure 2. Relationship between *availability* and length estimated from paired sampling data using a cubic spline. The horizontal line represents the average *availability*.

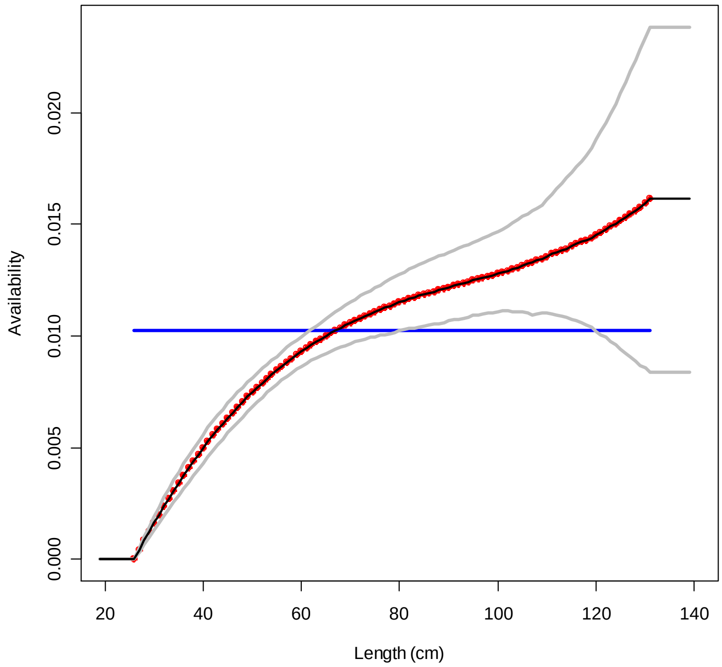
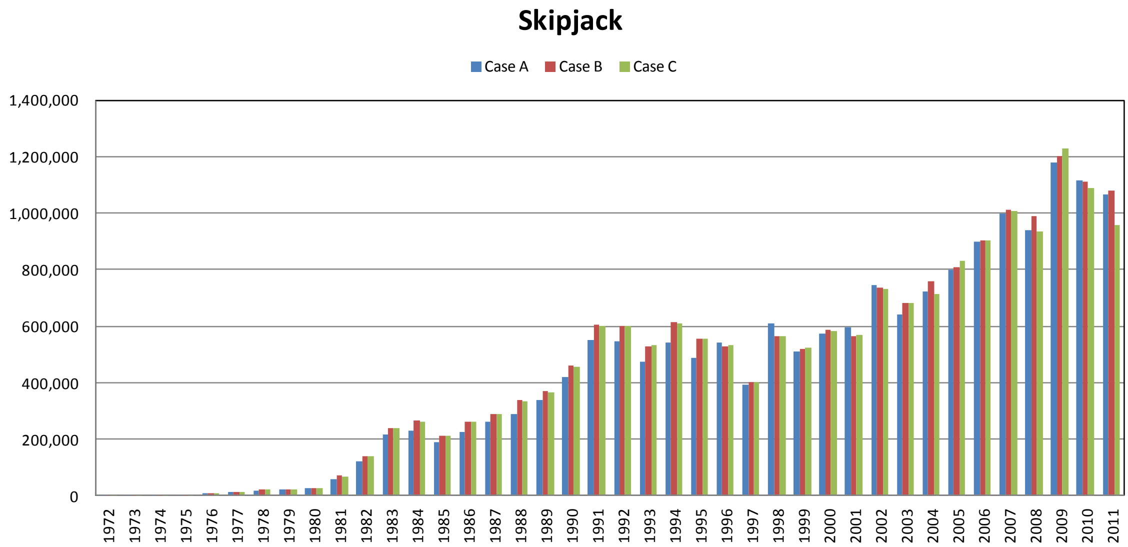
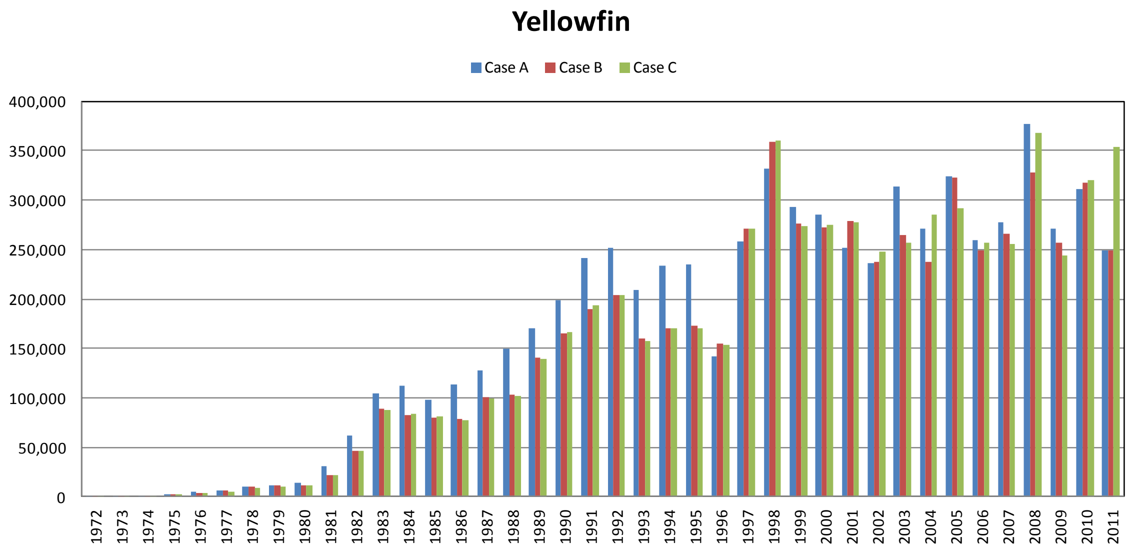


Figure 3. Annual purse-seine catches in MFCL Skipjack Areas 2 and 3 determined from three models of the species composition





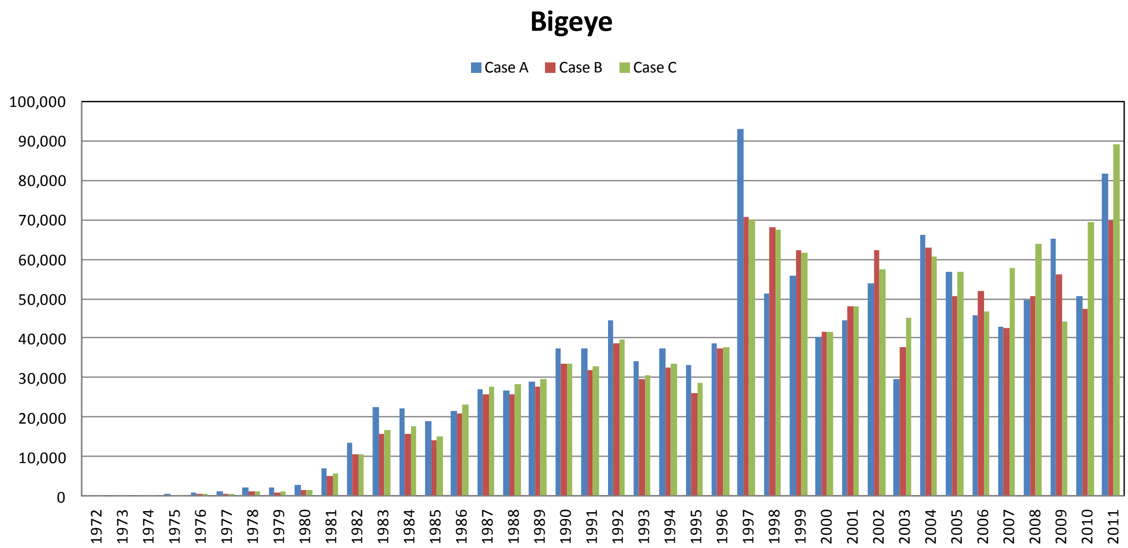
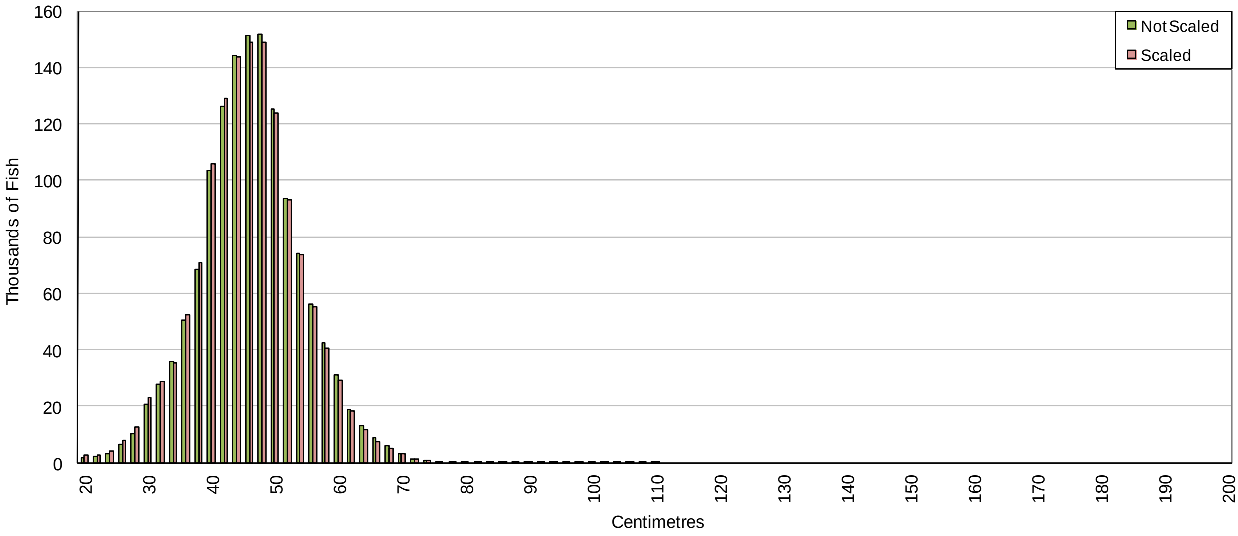


Figure 4. Unscaled and scaled length frequencies determined from grab samples corrected for selectivity bias and spill samples, 1993–2011

Skipjack -- Associated Schools



Skipjack -- Unassociated Schools

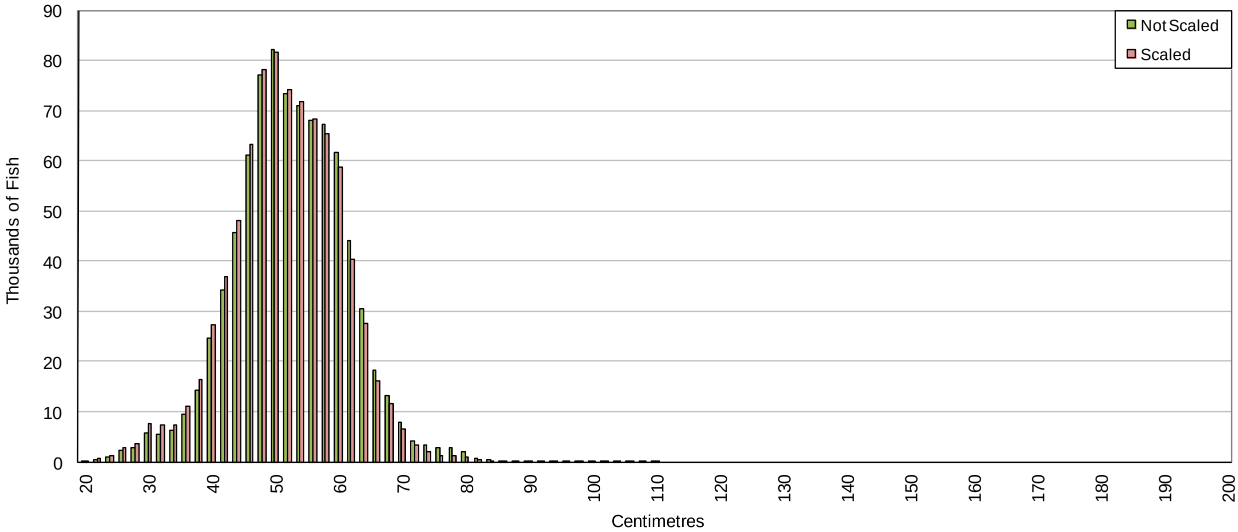
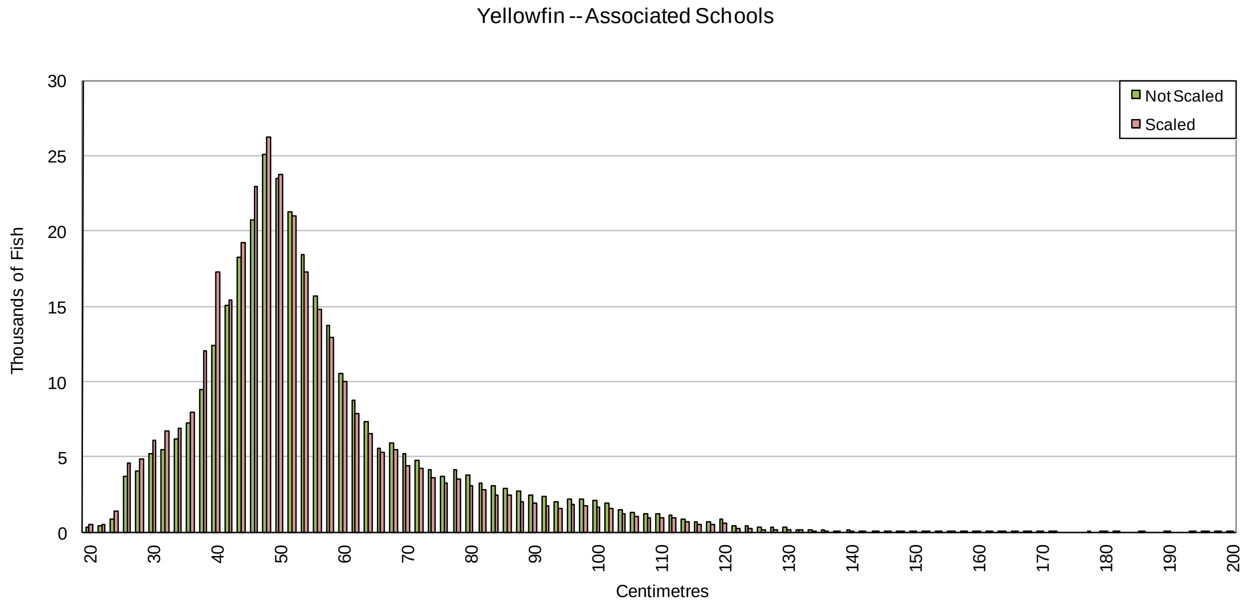


Figure 4 (continued)



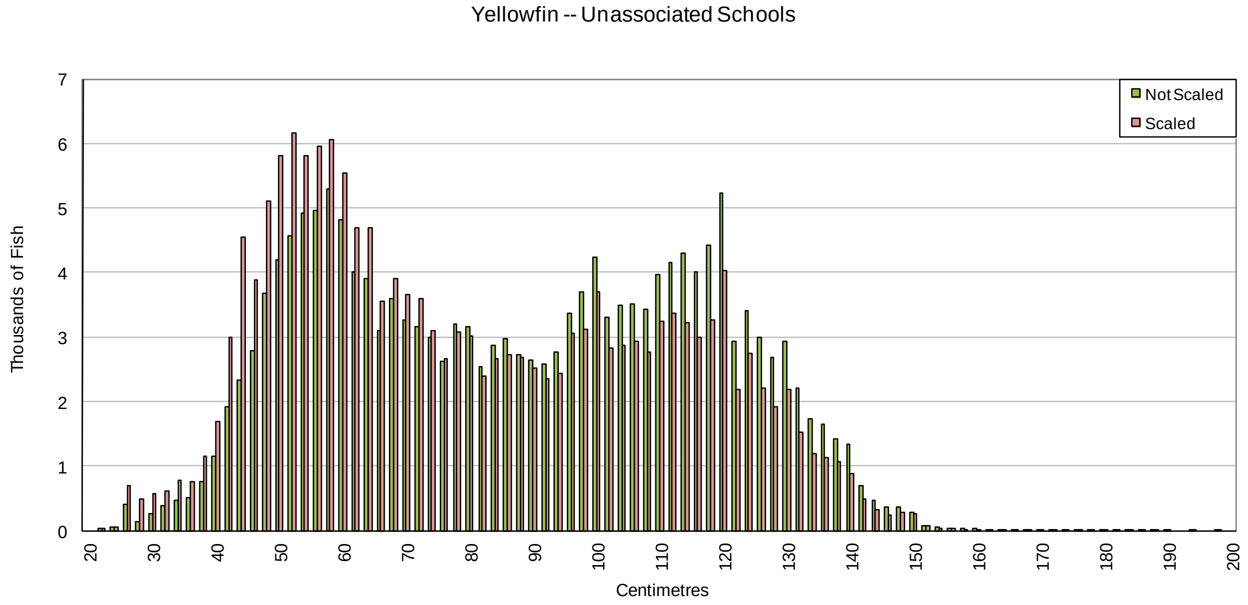
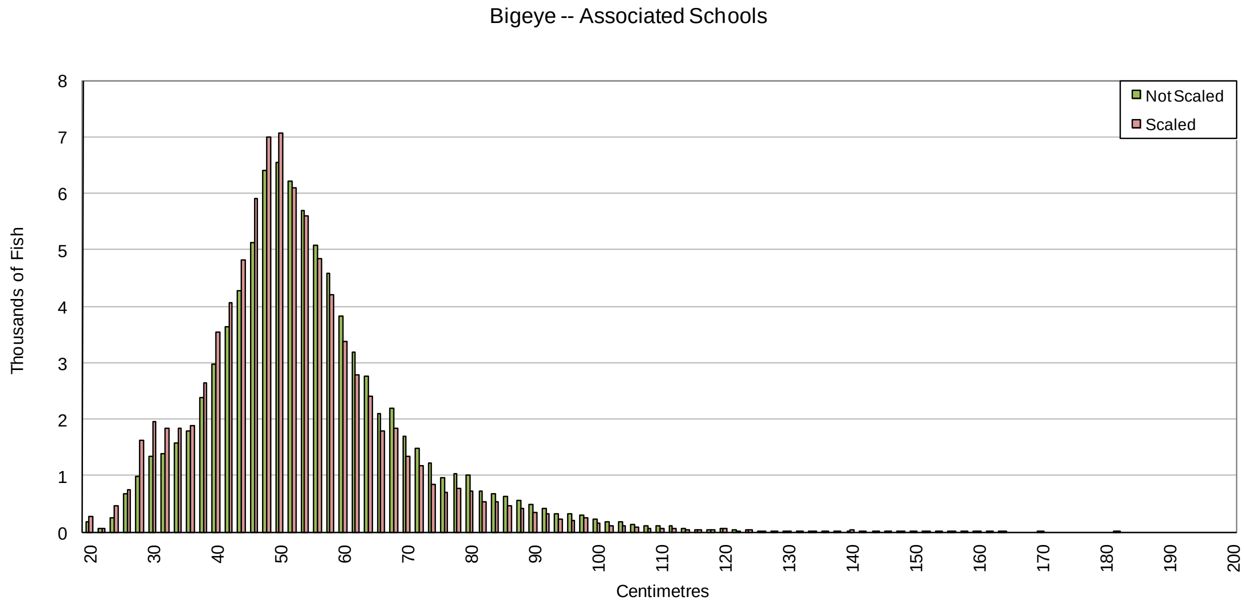
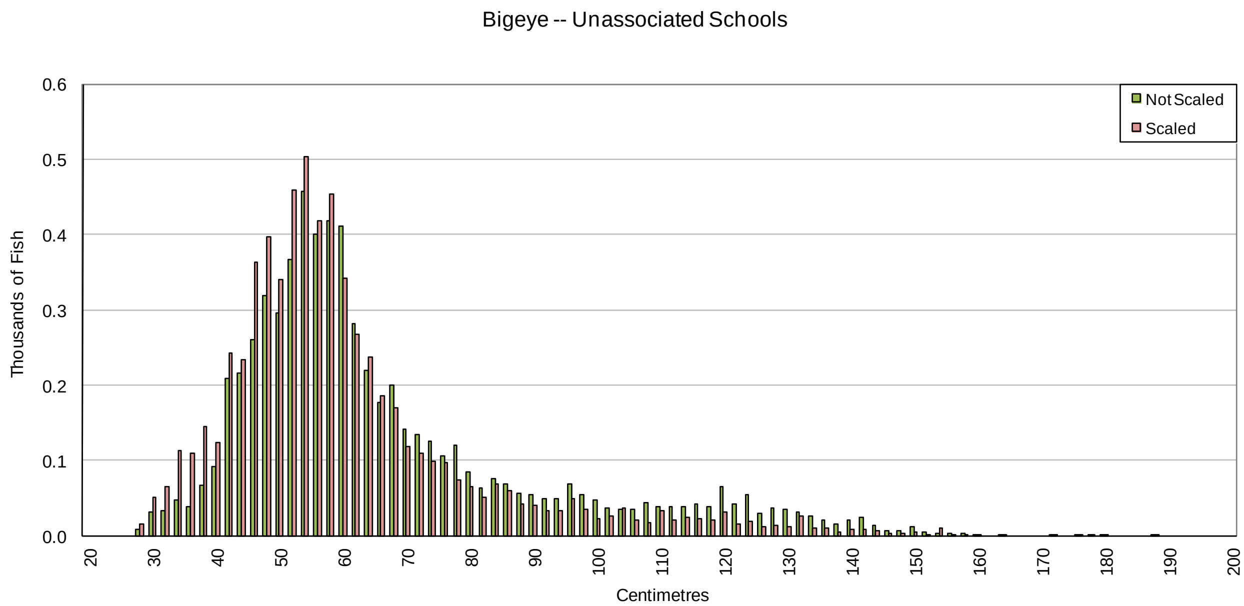


Figure 4 (continued)





Appendix I. Comparison of species compositions determined from logsheets, grab samples, spill samples, cannery receipts and port samples for vessels landing in Noro, Solomon Islands

A project to compare the species compositions determined from spill samples with those determined from cannery receipts adjusted with port sampling data, for purse-seine trips for which the catch is landed at Noro and delivered to the cannery run by the Soltai Fishing and Processing Company, was organised in October 2011 in cooperation with National Fisheries Development Ltd (NFD). Under the project, ten trips on NFD seiners will be undertaken by February 2013. For each trip, (i) spill samples from each set will be collected by an observer at sea and (ii) fish sorted into landing categories will be sampled in port. The species composition for each trip will be estimated from (a) the spill samples, together with the total amount caught from each set, and (b) the cannery receipts, by landing category, adjusted with the samples of the landing categories collected in port. The species compositions determined from logsheets, grab samples and unadjusted cannery receipts will also be compared.

Trip #1

The first trip was taken from 27 November to 13 December 2011. Eleven successful sets were made, with ten on anchored FADs and one on an unassociated school. The total catch recorded on the logsheets was 185 tonnes of skipjack and 165 tonnes of yellowfin, for a total of 350 tonnes; no bigeye were recorded on the logsheets.

Two observers took grab samples and spill samples, respectively, from all sets, but the data from the spill samples cover only nine of the sets because of malfunctions with the observer’s voice recorder during two of the sets. The grab sampler selected 690 fish from the eleven sets, while the spill sampler measured 2,864 fish from nine sets.

On December 14 and 15, the fish were landed and sorted into nine landing categories of species and size, including three size categories for skipjack and six for yellowfin. The catch was not sorted into separate landing categories for bigeye. The total catch recorded on the cannery receipts was 146.916 tonnes of skipjack and 181.664 tonnes of yellowfin, for a total of 326.580 tonnes.

During the sorting, all fish were dumped onto a large table and each fish was sorted into a bin for the appropriate landing category. The port samplers selected one bin for each of the nine landing categories and sampled all of the fish in the bin; there was therefore no selectivity bias during the port sampling. The results from the port sampling are shown in Table 3. There were no errors sorting by species for skipjack, while 23 bigeye were sampled from the landing categories for yellowfin.

Table 3. Port sampling statistics on sorting by species for Trip #1

Species Category	Size Range	Number of Fish Sampled				Weight of Fish Sampled (kg)				Proportion of Weight in Sample		
		SKJ	YFT	BET	TOT	SKJ	YFT	BET	TOT	SKJ	YFT	BET
Skipjack	1.3 - 1.8 kgs	580	0	0	580	1,089	0	0	1,089	100.0%	0.0%	0.0%
	1.8 - 3.4 kgs	398	0	0	398	1,142	0	0	1,142	100.0%	0.0%	0.0%
	3.4 - 10 kgs	232	0	0	232	1,190	0	0	1,190	100.0%	0.0%	0.0%
	ALL	1,210	0	0	1,210	3,421	0	0	3,421	100.0%	0.0%	0.0%
Yellowfin	< 1.3 kgs	0	216	10	226	0	230	13	244	0.0%	94.6%	5.4%
	1.3 - 1.8 kgs	0	274	12	286	0	508	19	527	0.0%	96.3%	3.7%
	1.8 - 3.4 kgs	0	291	0	291	0	1,114	0	1,114	0.0%	100.0%	0.0%
	3.4 - 10 kgs	0	163	1	164	0	1,024	5	1,030	0.0%	99.5%	0.5%
	10 - 20 kgs	0	92	0	92	0	904	0	904	0.0%	100.0%	0.0%
	> 20 kgs	0	32	0	32	0	798	0	798	0.0%	100.0%	0.0%
	ALL	0	1,068	23	1,091	0	4,578	38	4,616	0.0%	99.2%	0.8%

Table 4 shows the species compositions determined for Trip #1. For the grab samples, the species compositions, in weight, from the samples from each of the eleven sets were multiplied by the weight of the set recorded on the logsheet to determine the catch by species for each set; the observer's estimate of the set weight was not available at the time of the analysis and, in any case, the observer's estimate is usually close to the weight recorded on the logsheet. The species composition for the trip was then determined by summing the catches by species per set and dividing the results by the total catch per trip.

For the spill samples, the species compositions from the samples from nine of the sets were multiplied by the set weight recorded on the logsheet to determine the catch by species per set. The estimates of the catch by species for the trip in Table 4 were then determined by applying the species composition for the nine sets combined to the total catch for the trip. The species composition for the trip determined from the spill samples is therefore less exact than if the data for all of the sets had been available, which would have been the case if the observer's voice recorder had not malfunctioned.

The port sampling data were used to determine the species compositions for each landing category (Table 3) and the cannery receipts and species composition for the trip were adjusted accordingly ("Port samples" in Table 4).

Table 4. Species compositions determined for Trip #1

Source	Catch (tonnes)				Species Composition		
	Skipjack	Yellowfin	Bigeye	Total	Skipjack	Yellowfin	Bigeye
Logsheets	185.0	165.0	0.0	350.0	52.9%	47.1%	0.0%
Grab Samples	168.1	177.9	4.0	350.0	48.0%	50.8%	1.1%
Spill Samples	160.5	188.1	1.4	350.0	45.9%	53.8%	0.4%
Cannery Receipts	145.9	180.7	0.0	327.0	44.7%	55.3%	0.0%
Port Samples	145.9	180.1	0.6	327.0	44.7%	55.1%	0.2%

The most accurate species composition is almost certainly the cannery receipts, for which the fish in each landing category are weighed, after adjusting for the port samples, which resulted in 44.7% skipjack, 55.1% yellowfin and 0.2% bigeye. This was almost identical to the results from the cannery receipts because of (a) the relative ease of sorting skipjack from yellowfin and (b) the fact that only a small amount of bigeye were caught during the trip. The next most accurate species composition is that determined from the spill samples, followed by the grab samples and then the logsheets. The results from the spill samples are close to those from the cannery receipts corrected with port samples, which is somewhat surprising given that the spill sample data covering two of the eleven sets were not available. The results from the logsheets, on which catches estimated by counting brails are recorded, are the opposite of those from the cannery receipts, with more skipjack than yellowfin on the former and more yellowfin than skipjack on the latter. The results for the grab samples are better than those for the logsheets, but worse than those for the spill samples, even though data covering the grab samples from all eleven sets were available.

While the main objective of the project is to compare the species compositions, the accuracy of the sorting by size category during landing was also examined. The lengths (cm) measured by the port samplers were converted to weights (kg) using the length-weight parameters given in the Introduction. For each landing category, Table 5 shows the number of fish of the correct size for the size range, and the numbers of fish under and over the size range, in the port samples. The results suggest that the sorting by size is less accurate than the sorting by species, with landing categories of small fish containing larger fish and vice versa. However, these results depend on the accuracy of the length-weight conversions; more reliable results would be obtained by weighing each fish in the sample.

Table 5. Port sampling statistics on sorting by size for Trip #1 (see text)

Species Category	Size Category	Number of Fish Sampled				Proportion of Fish Sampled		
		Under	Correct	Over	Total	Under	Correct	Over
Skipjack	1.3 - 1.8 kgs	54	157	369	580	9.3%	27.1%	63.6%
	1.8 - 3.4 kgs	4	319	75	398	1.0%	80.2%	18.8%
	3.4 - 10 kgs	2	230	0	232	0.9%	99.1%	0.0%
	All	60	706	444	1,210	5.0%	58.3%	36.7%
Yellowfin	< 1.3 kgs	0	191	35	226	0.0%	84.5%	15.5%
	1.3 - 1.8 kgs	61	51	174	286	21.3%	17.8%	60.8%
	1.8 - 3.4 kgs	0	54	237	291	0.0%	18.6%	81.4%
	3.4 - 10 kgs	0	159	5	164	0.0%	97.0%	3.1%
	10 - 20 kgs	50	42	0	92	54.4%	45.7%	0.0%
	> 20 kgs	6	26	0	32	18.8%	81.3%	0.0%
	All	117	523	451	1,091	10.7%	47.9%	41.3%

Appendix II. A Report on Spill Sampling Bin Capacity

The ISSF cruise presented an opportunity to do spill sampling and at the same time collect accurate data on the range of mean sizes of fish required to fill the bin. This is something that had not been addressed in past sampling trips. These data will give us more precise information on bin capacity requirements when making considerations for constructing sampling bins. Also this information can be used to assess the data brought in by spill samplers during spill sampling trips.

The bin used during this trip was fabricated from stainless steel by a company in New Zealand. The bin specifications: length = 150 cm, width = 130 cm, height #1 = 70 cm and height #2 = 88 cm. A photograph of the bin is shown in Figure 5.

Figure 5. Measuring fish from the spill sampling bin on board FV Cape Finisterre

Though it suffered a dent during the ISSF trip, overall it proved to be strong and reliable for the sampling work. It is light in weight and can be easily moved by two persons, which are important factors when doing sampling work out at sea.

The data were recorded only for sets for which the bin was filled to the brim by the fish in the sample. During the trip around 95% of the spilled samples captured in the bins were full to overflowing. A summary of the data collected is presented in Table 6.

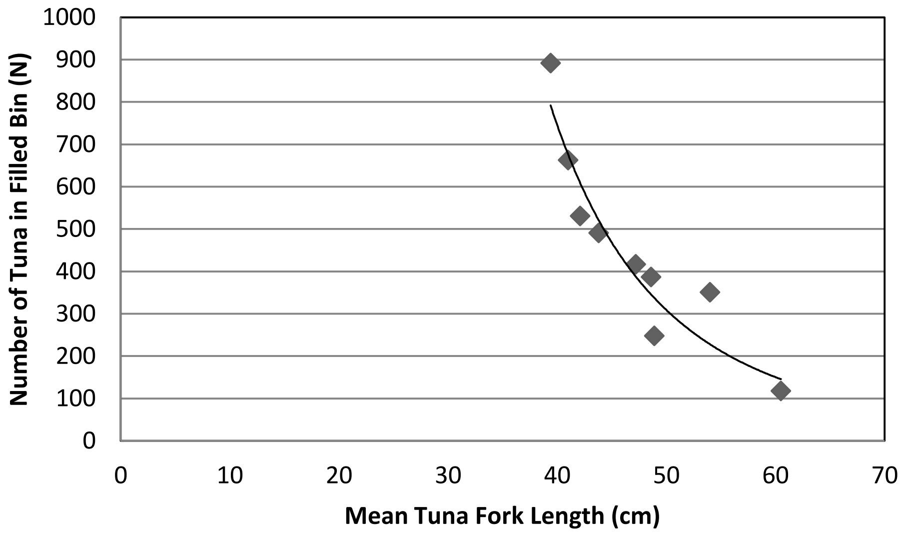
Table 6. Number of fish and their average sizes required to fill the sampling bin

Set #	Bin fullness	Number of fish	Average size FL (cm)
3	Full	892	39.4
4	Full	531	42.1
5	Full	248	48.9
6	Overflow	351	54
7	Full	663	41

8	Full	118	60.5
9	Full	387	48.6
10	Overflow	417	47.2
11	Full	491	43.8
12	Full		

A plot of the numbers of fish in the bin versus the average length of fish in the sampler is shown in Figure 6. This plot shows that a small change in average size or size composition in a given sample will result in a significant change in the number (n) of fish samples in a bin.

Figure 6. Number of tunas in a filled sampling bin and their mean fork lengths (cm)



The data show that the number of fish ranges from about 700–900 for fish less than 40 cm to 250–400 fish of about 50 cm, to about 120 for fish of about 60 cm. These sample sizes are larger than those typically used in analyses of the species composition and suggest that a somewhat smaller bin may be appropriate.

Appendix III. Spill Sampling Protocol

Aim of Spill Sampling

- To collect samples that can be used to estimate the species composition and the length frequency, either of the catch per trip or the catch in strata of time period and geographic area, such as strata of 1° x 1° grid and month or strata of MFCL Area and quarter.

Equipment Used

- [Spill sampling bin (Figure 7–9) of dimensions: length = 150 cm, width = 130 cm, height #1 = 70 cm and height #2 = 88 cm.] The bin size may need to be modified to suit the deck layout and the mode of operation of brailing of certain vessels.

- Measuring board, caliper and data collection forms.

- Voice recorder, earphones and aquapac waterproof housing.

Sampling Protocol

Sets of 20 tonnes or more

1. Spills samples are usually taken from every tenth brail during a set. The number of the first brail to be sampled is changed with each set to avoid the effects of layering by size. The Brail Selection Guide (Figure 9) can be used to select the first brail to sample.

2. Advise the brail winch operator of the brail to be sampled just as the brail is being transferred from the net to the vessel. The brail winch operator must not be warned any further in advance of the brail to be sampled, otherwise he may be tempted to modify his brailing behaviour, which may introduce unwanted bias.

3. Open the selected brail to discharge a portion of the content to fill the sampling bin (Figure 7). It is important that the bin always be filled to the brim, regardless of the size of the fish. The sample size of a spill sample is determined by the volume of the bin; thus, there will more fish in the sample when the fish are small than when they are large.

4. Check that the voice recorder is turned on.

5. Verbally identify the species of each fish in the bin, including non-target species, and measure the fork length by placing the fish on a flat surface, such as a measuring board, and using the caliper to measure the length from the tip of the snout to the fork of the tail.

6. Repeat steps #2 to #5 for every tenth brail until brailing is complete.

Sets of less than 20 tonnes

- At least one spill sample must be taken from each set. However, for small sets for which there will only be a small number of brails, brailing may terminate before the first brail chosen from the Brail Selection Guide. Therefore, for small sets, if the first brail chosen from the Brail Sampling Guide is brail #3, choose instead brail #1; if the first brail chosen from the Guide is brail #4 or #5, choose instead brail #2; if the first brail chosen from the Guide is brail #6 or #7, choose instead brail #3; and if the first brail chosen from the Guide is brail #8 or #9, choose instead brail #4. If the subsequent set is also small, then the first brail should be rotated, similar to what is done for the large sets.

Figure 7. Discharging fish from the brail to the bin

Figure 8. Measuring fish from the spill sampling bin

Figure 9. Spill sampling bin showing height #1 and height #2

Figure 10. Brail selection guide

SET NO.	BRAIL NUMBER																						
1	**1**	2	3	4	5	6	7	8	9	10	**11**	12	13	14	15	16	17	18	19	20	**21**	22	23
2	1	**2**	3	4	5	6	7	8	9	10	11	**12**	13	14	15	16	17	18	19	20	21	**22**	23
3	1	2	**3**	4	5	6	7	8	9	10	11	12	**13**	14	15	16	17	18	19	20	21	22	**23**
4	1	2	3	**4**	5	6	7	8	9	10	11	12	13	**14**	15	16	17	18	19	20	21	22	23
5	1	2	3	4	**5**	6	7	8	9	10	11	12	13	14	**15**	16	17	18	19	20	21	22	23
6	1	2	3	4	5	**6**	7	8	9	10	11	12	13	14	15	**16**	17	18	19	20	21	22	23
7	1	2	3	4	5	6	**7**	8	9	10	11	12	13	14	15	16	**17**	18	19	20	21	22	23
8	1	2	3	4	5	6	7	**8**	9	10	11	12	12	14	15	16	17	**18**	19	20	21	22	23
9	1	2	3	4	5	6	7	8	**9**	10	11	12	13	14	15	16	17	18	**19**	20	21	22	23