External Advise to improve the verification of reported weights and for identifying the extent of unaccounted mortalities.

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1. The review of all CCSBT-ESC documents and information related directly or indirectly with unaccounted catch mortality of SBT (2006-2019)

➢ Working approaches

- Specific: on technical specific details of scientific documents (doubts and questions were addressed to the authors).

- Global: on the basic of the problem and the debate.

Reported Catch

Harvested weight

Estimated Catch

Estimated Growth

Unaccounted F

LF from 40/100
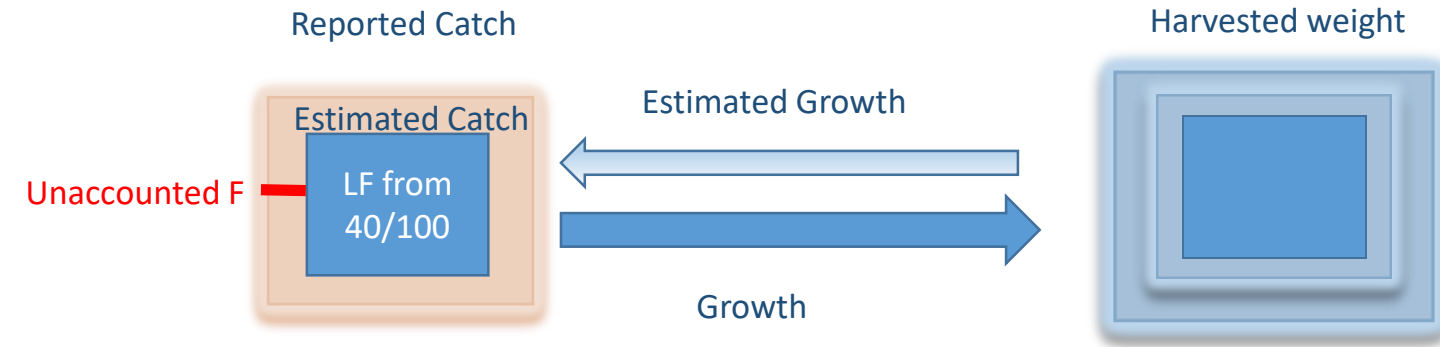
Growth

The debate has revolved around <u>recurrent main issues</u>.

1. The representativeness of 40/100 fish sampling.

2. Estimations of growth during farming.

3. Age composition (estimated vs reported)

4. Others (L-W,..)

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1. **The representativeness of 40/100 fish sampling.**

   Required info to answer it:

1) The analysis of LF distribution for different sample sizes.

2) <u>Comparison of LF of sampled fish with the LF from video camera measurements.</u>

2. Estimations of growth during farming.

- Estimated from tagged fish (the only available direct info), Apx. <u>six months</u> in captivity.

 Mentioned Concern: the potential negative effect of tagging on fish growth.

  (Hearn, et al 1986): Tagged fish recovered the weight loss within <u>a year</u>.

Summary of growth performance in weight

References from CCSBT/1708/Info 02

	Final W	Initial W	Factor	days	months	
Gordon et al., 2006	30,13	16	1,88	173	5,70	
SBT	28,70	14,5	1,98	170	5,60	
	45,30	26	1,74	174	5,80	
Itoh et al., 2009	18,80	10,34	1,82	161	5,37	
SBT	27,42	17,97	1,53	164	5,47	
	40,16	28,46	1,41	194	6,47	
ABFT						
Kataviae et al., 2001	30,81	I10-25	1,78		17	adjusted to 5.5 months
Ticina et al., 2007	22,07	12	1,84		18	adjusted to 5.5 months
ICCAT (2009) REPORT	19,90	10	1,99		18	adjusted to 5.5 months
Galaz (2011)	36,80	19,5	1,89		4	
Goto (2014)	33,50	16	2,09		6	
PBT	18,50	9	2,06		6	
Sylvia et al. (2006)						
PBF	100	45	2,22		2	adjusted to 5.5 months
Bigeye	66	I25-30	2,40		2	adjusted to 5.5 months
Yellowfin	50	I20-25	2,22		2	adjusted to 5.5 months

Red line: Average weight gain (2009-2017). Ratio of harvested weight in CDS and reported PS catch

iw:Var4: y = 2,208 - 0,0227*x; r = -0,6848; p = 0,0140; r^2 = 0,4689
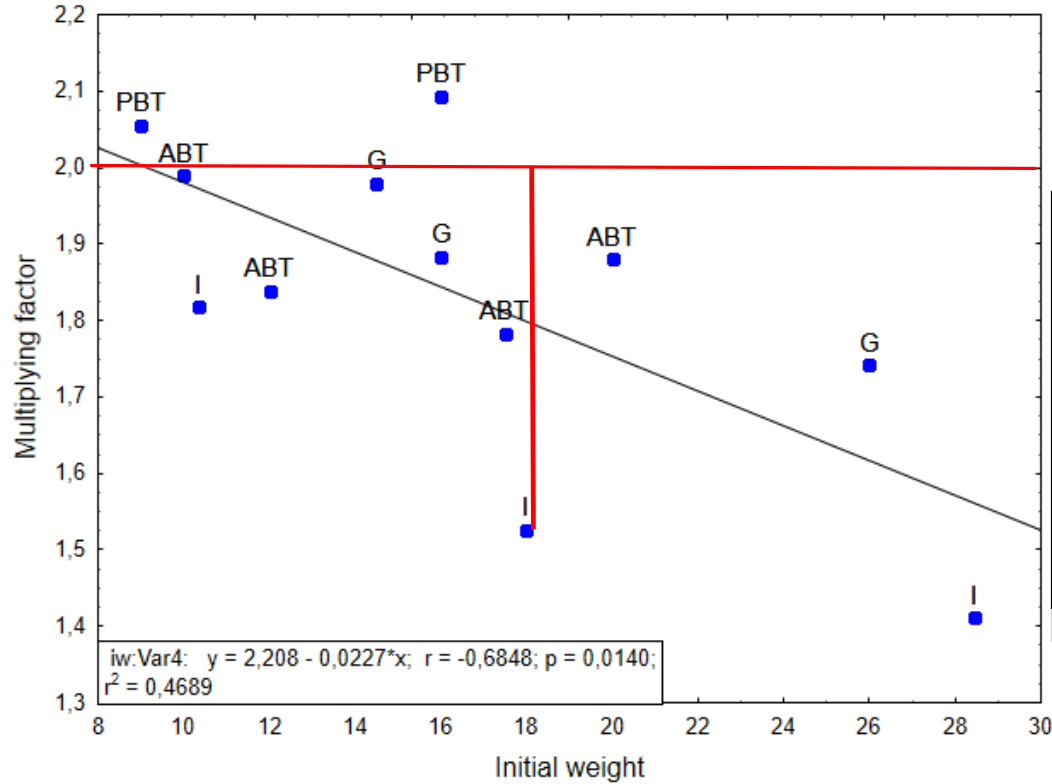
Australia quota year (Dec - Nov) e.g. 2009 = Dec 2009 to Nov 2010	Wild catch (PS) Catch_mt	Harvested from Farm Harvest_mt	
2009	3.931	7.092	1,805809
2010	3.872	8.376	2,165107
2011	4.485	8.468	1,889633
2012	4.198	9.301	2,217255
2013	5.029	10.220	2,033666
2014	4.947	9.733	1,969042
2015	4.896	10.172	2,079273
2016	4.683	9.070	1,938523
2017	5.123	10.065	1,966114
			2,007158

A complementary action but not a solution: specific tagging program.

3. Age Composition based on Length Frequency from market sampling data.

Mentioned Concerns: the representativeness of the market sampling and how the LF is converted to age.

Mentioned Solution/ Improvement: The use of CDS data.

  Benefits: LF will be fully representative of harvested sizes .

      The use of CDS data by month will provide additional valuable information (e.g L-W), the LF of the first

         harvested fish (less than a month) might be closer to the LF of the catch (if harvesting is random).

  Caution: Harvested LF do not necessary reflect LF in the cages.

  Challenge: Conversion to age

  Requirement: Insight to the methodology of back-calculation (estimate of initial fish length from harvested

length) with size dependent growth rates.

4. Differences between reported CAA and estimated CAA.

Mentioned potential cause: PS fleet might target on larger fish and/or size selectivity is biased towards smaller fish of 40/100 sampling.

Attention: according with the age structure of tagged fish caught by PS (CCSBT-ESC/0909/31): 34% age 2, 59% age 3 and 7% age 4 the assumption that PS is targeting on larger fish is unlikely.

Action: Check the initial LF of all individuals from tag-recapture data to enhance the representativeness (> 8000).

Keys to solve the problem

1. Optimization of input and output data
2. Avoid indirect growth estimations

Reported Catch

Estimated Growth

Harvested weight

Unaccounted F — LF from 40/100

Growth
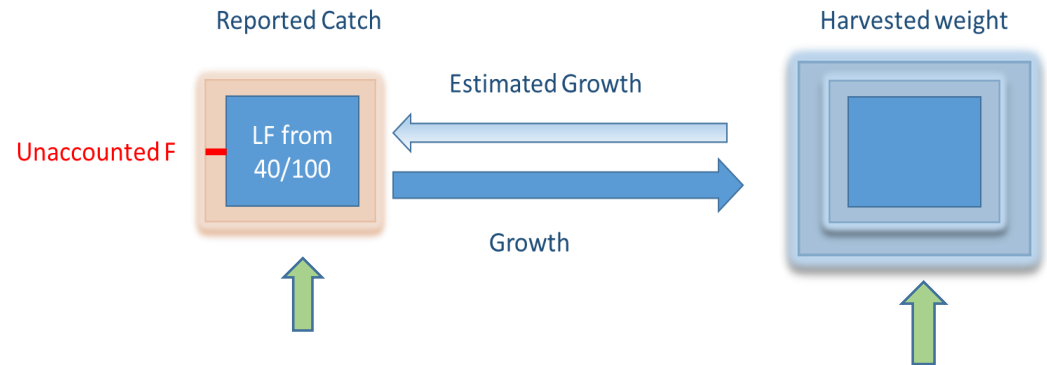
Tools to solve the problem

1. The use of video-cameras will permit:
   - **To get a representative LF of the catch (CAA)**
   - To assess the uncertainty of 40/100 sampling and the past estimates.
2. CDS info will permit:
   - **To get a representative LF at harvesting.**
   - To get a good L_W relationship during farming.
   - To get information on size harvesting strategy.
3. The development of tagging experiments will permit:
   - To correct past information with best possible growth estimates.
   - To stablish upper boundaries of growth rates for future control measures

No more at this point

Thank you all for your attention