PREPARATION OF NEW ZEALAND CATCH AND EFFORT DATA FOR THE CCSBT DATA EXCHANGE

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1 INTRODUCTION

The purpose of this paper is to describe the data which is available for New Zealand fisheries catching southern bluefin tuna (SBT) and how that data is provided to CCSBT for the formal Data Exchange. By providing detailed descriptions of the procedures for preparing the data we hope that the SAG/SC can review these processes to ensure that New Zealand is preparing its data in a transparent way that is consistent with the approaches of others CCSBT members. This is particularly important at this time, as 2005 marks the first year where New Zealand have provided raised catch at length and age data for the entire time series. This paper first describes the fleets that have taken SBT in New Zealand fisheries, the sources of data that are (or were) available, and the processes used to prepare data for the 2005 Data Exchange.

2 FLEETS

Prior to the establishment of the EEZ, Japanese distant water longliners fished the waters beyond the limits of the territorial sea. Fishing by this fleet of up to 87 vessels was done in nearly every month, although the months fished and the number of vessels fishing declined dramatically from 1980 to 1995 (the last year of foreign licensed access). A small fleet (3–6 vessels) of distant water Japanese longliners chartered by a New Zealand company began fishing off the West Coast of the South Island from 1989 onwards. The chartered fleet fishes against New Zealand's national allocation of 420 t. Domestic vessels began fishing by handline and trolling in the early 1980s from June to August targeting southern bluefin tuna attracted to the surface by hoki factory trawlers. Southern bluefin tuna catches by this fleet of small vessels, always to some extent constrained by weather, have hardly featured since the advent of domestic longlining beginning in 1991. Table 1 summarises the fleets that have targeted or caught southern bluefin tuna in New the waters around New Zealand.

Table 1: Description of the fleets that have caught SBT in New Zealand fisheries waters.

Fleet	Description	Years in operation	Comments
Japanese foreign vessels	Distant water fleet of vessels approximately 50 m LOA	1965 to 1995	An unreported number of vessels fished what is now within the EEZ from 1965 to 1979. Following establishment of the EEZ in 1979 these vessels fished under a bilateral fisheries treaty granting foreign licences to operators. Foreign licensed

			access continued until 1995 when the last fishing was conducted. Vessel numbers declined linearly over this period from 87 vessels in 1980 to 2 in 1995.
Japanese charter vessels	3 to 6 Japanese distant water longliners have fished under charter to a New Zealand company in each year except 1996 during the March–August period or until the catch limit was reached and the season closed.	1989–1995; 1997–2005	Charter vessels fish against New Zealand's quota
Domestic handline/troll	Fleet composed of generally small domestic vessels (< 30 vessels) targeting SBT off the West Coast of the South Island from June to August, sometimes in conjunction with a larger vessel serving as a mother ship. Vessels frequently targeted fish that were feeding amongst hoki factory trawlers.	1989 onwards	This fleet has declined dramatically as domestic longlining increased and the New Zealand quota was largely taken before the start of this fishery. Only a few vessels report catches using these methods after 1996.
Domestic longline vessels	Fleet composed of generally small to medium sized domestic vessels (< 200 GRT) targeting SBT off the West Coast of the South Island and east coast of the North Island from April to August.	1991 onwards	Six vessels began targeting SBT on the east coast of the North Island in 1990 but made no catches. From 1991 onwards longline targeting and catches of SBT rapidly increased and the quota was taken well before the normal end of the SBT season. The entry of SBT to the Quota Management System has eliminated the Olympic style of fishing prior to 2004.
Philippine charter vessels	Two medium sized longliners targeting albacore	2003	Permits were conditioned so that they would not fish areas of high southern bluefin abundance and were required to move areas if they started catching them. Both vessels carried observers and were required to release any live SBT they caught.
Large trawl vessels			A small amount of SBT is sometimes taken as bycatch in fisheries for hoki and other species. In 2003/04 this amounted to about 7 tonnes.

3 DATA TYPES

Tuna landings data are compiled from either the Licensed Fish Receiver Returns (LFRR) filed monthly by each Licensed Fish Receiver and Monthly Harvest Returns (MHR) filed by the fishing permit holder. Catch, fishing effort, fishing operational data, and vessel information are from the catch and effort logsheet data provided by each permit holder to the Ministry of Fisheries on Catch Effort Landing Returns (CELR) and Tuna Longline Catch Effort Returns (TLCER). CELR forms are completed for each day of fishing for all gear types (e.g. handline, troll, and longline) while TLCER data are filled out only for surface longlining for tunas, these data are recorded for each longline set.

Additional information on catch composition, length and weight, sex ratio, discard and on loss rate of fish, is collected by staff from the Ministry of Fisheries Scientific Observer Programme. A summary of the data collected, its availability and some of the drawbacks to CELR and TLCER data is given in Table 2.

Tuna fisheries catch and effort data have been collected by the Ministry of Fisheries (Ministry of Agriculture and Fisheries at that time) since at least 1976, but changes to data collection and processing mean that domestic fisheries catch and effort data are not currently available before 1989. CELR and TLCER data are available beginning with the third quarter of 1989 (start of the 1989–90 fishing year). However, tuna catches reported on CELR forms have a sufficiently high percentage of the catch reported in weight rather than number to make data up to at least 1990–91 unusable in most domestic tuna fisheries.

Table 2: Description of the types of catch, effort, and size data that are available for SBT (source: Ministry of Fisheries Catch Effort reference library version 2, August 2003).

Data type	Description	Years available	Comments
CELR (Catch Effort Landing Return)	The CELR is a general purpose form used for recording the taking of fish by any of a variety of methods. The bottom part of the form contains landing information (CLR). The top part of the form contains fishing details. A number of method-specific "templates" are used with the CELR form. The templates are overlaid on the standard CELR form and give instructions on filling in the form specific to particular types of method. the fishing details sections of the forms are mainly provided for the purposes of: • stock assessment- to provide a measure of catch per unit effort • policy evaluation –to determine the location and method of fishing • enforcement –to monitor activities of fishers • monitoring environmental performance –to monitor effort The catch effort returns relate details about the fishing activity (including the location of fishing) directly to an estimate of the amount of fish caught.	January 1988 onwards	In addition to this form there is a version specifically for reporting fishing by New Zealand vessels on the high seas known as the HS-CELR (High Seas CELR). The HS-CELR is nearly identical to the standard version of the form and was introduced 1 March 2001. There are a number of limitations and problems in this data set that need to be considered: • Because there is only space on the form for the catches of five species per unit of effort, species caught in small quantities may not be reported. • The catches reported are only estimates and are not weighed. Tuna catches are reported in numbers rather than weight.
CLR (Catch Landing Return)	Landing returns record the catch that is landed, lost, discarded at sea, or retained on board after a landing. Landing returns are required from all commercial fishing for all species, and hence, this is theoretically the most comprehensive source of information for commercial harvest levels in New Zealand. There are two types of catch landing	January 1988 onwards (CELR forms) January 1991 onwards (TLCER	Fish reported in the landings form usually cannot be related to the fish reported on the individual CELR or TLCER forms. If the vessel fished in several statistical areas within one trip then it is usually not possible to deduce how much of the landed catch was taken in each statistical area. The whole weights reported in the

	forms used in tuna fishing. The "Catch Landing Return" (CLR) is used by vessels using TLCER catch effort forms while the "Catch Effort Landing Return (CELR) has a section for reporting landings	forms)	landings are calculated from the processed catch weights multiplied by a conversion factor. The calculated whole weights are therefore only as accurate as the conversion. The whole weights of fish that are not landed to a Licensed Fish Receiver (e.g. fish discarded or trans-shipped) have historically not been fully recorded.
TLCER (Tuna Longline Catch Effort Return)	The TLCER is required for all fishing that targets tunas using surface longlining. Data reported on the TLCER is for one set and has the date at start of set and end of haul and the time at start and end of setting and hauling. Locations (of start and end of setting) are reported in latitude and longitude. Catches of all species are recorded in number and in total processed weight.	January 1980 to June 1995 (foreign licensed vessels) March 1989 onwards (charter vessels) March 1991 onwards (domestic vessels)	In addition to this form there is a version specifically for reporting fishing by New Zealand vessels on the high seas known as the HS-TLCER (High Seas TLCER). The HS-TLCER is nearly identical to the standard version of the form and was introduced 1 March 2001. The TLCER form was redesigned to include additional information on the position and timing of setting and hauling as well as disposition of catches from April 2003.
MHR (Monthly Harvest Return)	The main purpose of the MHR is for fisheries administration. A secondary purpose is to provide an information source concerning total harvest levels of quota and non-quota species for fisheries assessment.	October 2001 onwards	MHR reports are recorded by permit holder, fishstock and month. Fine scale information such as vessel (unless the permit holder used only one vessel), statistical area or the date of fishing are not available in this dataset. The catch within and beyond the EEZ is reported.
LFRR (Licensed Fish Receiver Returns)	The primary purpose of LFRR is for administration of the quota management system. LFRR data provides complete coverage of all species processed by licensed fish receivers. Fish not landed to a Licensed Fish Receiver (e.g. fish that are discarded) are not reported through this system.	January 1986 onwards	This dataset does not contain information about the origin of the fish apart from the quota holder. If a permit holder fishes in more than one fishstock in a month or uses more than one vessel, it may not be possible to relate the LFRR data to the landing records. This dataset is therefore useful mainly to estimate total catches for a species in a year. This dataset does not contain information about fish that was not landed to a Licensed Fish Receiver, such as fish that was discarded, eaten, sold at wharf etc.
Observer Data (longline vessels	To monitor the activities of fishing vessels operating in the New Zealand EEZ and to obtain reliable, accurate and independent catch, effort and biological	June 1988 onwards	This system does not cover all commercial catch. It covers a sample of the tuna longline fishing (about 1300 observer days budgeted in

only)	information.		2005/06), but for the trips that are covered, more detailed information is available than is available from the commercial catch forms completed by fishers.
DANSOL data	Historical data set of southern bluefin tuna caught by handline and trolling and landed to the Daniel Solander serving both as a fishing vessel and a mother ship for small domestic vessels	June 1982 to August 1991	

4 DATA PREPARATION

This section outlines the steps taken in the provision of data for the 2005 Data Exchange. In instances where the procedures have changed from previous years we have indicated that.

4.1 Total catch by fleet

4.1.1 Historical data

Total catch has been estimated from several sources. The New Zealand Fishing Industry Board used export data and reports by key industry representatives involved in developing the domestic southern bluefin fishery to provide the earliest estimates (1980–1986) of total southern bluefin catch. With the development of monthly reporting by Licensed Fish Receivers beginning in 1986, southern bluefin total catches have been estimated through the MHR/LFRR system for the period 1987–2004.

4.1.2 Data submitted in 2005 Data Exchange

There are three potential data sources on total catches: Licensed Fish Receiver Returns, Monthly Harvest Returns, and catch effort data. Comparisons of these three sources of data are routinely made and the Ministry of Fisheries frequently undertakes audits of the Licensed Fish Receiver. The MHR and LFRR are considered the most reliable and the estimates from each are almost identical (within 1%) so we use the MHR/LFRR data for our estimates of total catch. As these data are available at the permit holder level, we can use this information to separate catches by the Domestic and Charter Fleets.

4.2 Mortality allowance

Due to the design of New Zealand's tagging programme for 2003/04 (i.e. purchasing fish directly from fishers), there was no opportunity for using the research mortality allowance.

4.3 Catch and effort data

Southern bluefin tuna catch and effort data has been provided (usually annually) prior to the regular stock assessment to Parties to the Trilateral Arrangement and more recently to the CCSBT Commission. Data provided have been for each method targeting southern bluefin tuna or where it is a regular bycatch (handline, troll and longline) at a resolution of individual operation by vessel. Position data is provided as decimalised latitude and longitude truncated to 0.1 degree. A unique vessel key that cannot be used to infer ownership identifies individual vessels.

The Secretariat uses this operational level data to produce 1x1 degree resolution data for the Charter fleet which is used by Japan for further analyses.

4.3.1 Grooming routines

A set of loading and validating shell scripts are used to groom and validate tuna fishing data extracted from the MFish database. Data grooming follows a set of rules developed over a number of years that check for probable errors in catch, effort, operational details, and position. Specific checks are done for position, date and time of longline setting (start and end) and hauling (start and end), sea surface temperature, species code, catch is in number not weight, and that the number of hooks set is within a valid range for longlining. Data grooming is applied to all CELR (for methods = handline, pole-&-line, purse seine, surface longline, troll, and trotline) and TLCER (for method = longline) data. Grooming and database maintenance is done under contract to the National Institute of Water & Atmospheric Research (NIWA). Details of the grooming procedures that were applied to the data submitted for 2003 and 2004 are provided in Annex 1.

4.4 Raised catch data

The information required to calculate the raised catch data are **catch and effort data** and the **total catch by fleet** estimates. As in previous years, the Secretariat produced New Zealand's raised catch data by fleet in weight and numbers based on the total catch by fleet and operational level catch and effort data. For 2006 at least, New Zealand will continue to use the Secretariat to produce these data.

4.5 Raised catch at size data

The information required to calculate the raised catch at size data are **raised catch data** and the **individual fish measurements**. The calculations were all undertaken using the S+ programming language and the scripts used are too long to reproduce here, but are available on request.

We have two sources of individual fish measurements available for these calculations, **observer measured lengths** and **fisher estimated processed weights**, and they vary in the availability and reliability. We consider the observer length estimates to be most reliable and these are used when available.

Calculations were undertaken separately for the Japanese Charter and NZ Domestic longline fleets. Raised catch at length was not calculated for the Philippine flagged vessels that caught 15 fish in 2003, or the NZ domestic handline fisheries that operated in the late 1980s.

The steps involved in the calculations are listed below:

- Convert processed weights to lengths based on conversion factors (Table 3)
- Stratify the observer length samples by Year / Month / 5 degree area and calculate size composition (proportions at length)[1]
- Stratify the fisher weight samples by Year / Month / 5 degree area and calculate size composition (proportions at length)
- Compare the coverage of the samples to the spatial distribution of the catches and choose:
    - which source of individual fish measurements to use
    - which strata to substitute size composition data for instances where no measurements exist, but catches were taken
- For each strata where catches were taken, multiply the size composition data by the larger number of the raised catch in numbers or the number of individual fish measurements available.

[1] An error was made in assigning measurements to 5 degree areas for the data first submitted to CCSBT (**9 May 2005**). Thanks to Scott Cooper from CSIRO, the error (related to the peculiarity of rounding in S+) was fixed and the corrected raised size data were resubmitted (**3 June 2005**)

Table 3: Parameters for the conversion of processed weight to length.

STATAREA	QUARTER	CUTOFF	AADULT	BADULT	AJUV	BJUV
5	1	34.04408	0.0000013235	3.505451	0.0000018948	3.440505
5	2	33.44799	0.0000014273	3.486301	0.0000016423	3.481906
5	3	34.25073	0.0000020555	3.416246	0.0000015099	3.491535
5	4	34.25073	0.0000020555	3.416246	0.0000018948	3.440505
6	1	34.04408	0.0000013235	3.505451	0.0000018948	3.440505
6	2	33.05681	0.0000023027	3.385630	0.0000016423	3.481906
6	3	34.25073	0.0000020555	3.416246	0.0000015099	3.491535
6	4	34.04408	0.0000013235	3.505451	0.0000018948	3.440505

After considering the availability of individual fish measurements, the data were used for each fleet or described in Table 4. As there was sufficient observer coverage of the Charter fleet we used these data where the were available. The observer coverage was insufficient for the Domestic fleet so we used the processed weight estimates for the years they were available.

Table 4: Sources of data used in calculating raised catch at length. Numbers in parentheses indicate the number of required at the 5x5 degree month level.

Data source	**Japanese Charter Fleet**	**NZ Domestic fleet**
Observer lengths	1991-2004 (49)	2003-2004 (41)
Fisher weights	1989-1990 (6)	1990-2002 (145)

Even with these choices of data, there were still strata for which no individual fish measurements were available. In these instances we substituted the size composition estimated for an adjacent strata.

The substitution routine was not automated, but was based upon the following principles:

- the nearest strata in the same month with the largest sample size, then
- the same strata in the closest month with the largest sample size, then
- the nearest strata in the closest month with the largest sample size

We did not substitute data from different fleets (e.g. apply size composition estimates from the Charter fleet to the Domestic Fleet), or different sources of size data (e.g. we did not consider using Fisher estimated process weights to substitute strata in the Charter fleet over the years 1991-2004), or did we substitute data at a coarser level (e.g. we did not group size composition data for a number of 5 degree areas over a month). Each of these options would require considerable extra coding to allow implementation and it is not clear that these would noticeably improve the quality of the data.

For the Charter fleet most of the substitution was for the period 1991-1993 and no substitution was required after 1998. Furthermore, most of the strata where substitution occurred had low catches.

For the Domestic fleet considerable substitution was required and subsequently the reliability of the raised length data is much less than that for the Charter fleet.

The decision to chose the larger number of the raised catch and the fish measurements was supposed to allow for better estimates of catches from observers when compared to fishers. However, because of low observer coverage in some strata, it is only possible to consider higher estimates from observers, but not lower estimates. This introduces a positive bias and results in two estimates of total catch in numbers. In the small number instances where the number of fish measurements was greater than the raised catch, the difference was generally low (less than 5%). From 2006, we propose to take the raised catch estimate of numbers irrespective of the number measured. This will result in some changes to historical data submitted this year, differences will result in small decreases as the number of fish in some strata.

4.6 Catch at age data

The information required to calculate the raised age data are **raised catch at size data** and the **Scientific Committee 2001 growth curve**. The S+ code for undertaking these calculations is provided in Annex 2.

The length cut-offs for the age bins were modified depending on when the fish was taken. As the length data where stratified by month we used the 15th day of the month to determine the cut-offs. Fish with lengths on the upper cut-off were included in the older age class[2].

An alternative approach would involve using ageing the individual fish measurements based on the actual date of capture and then raising the "aged" samples. Compared to the approach used here, our estimates of "capture date" could be off by up to 15 days. For the sizes of fish taken in the New Zealand fisheries (and their growth rates) the differences between the two approaches are minimal. Furthermore, the approach of linear interpolation of length cut-offs assumes continuous linear growth during the year which is unlikely to hold. Based on these factors we do not propose to change the way in which we age our samples at this time.

4.7 Direct ageing

Direct ageing data were provided to the Commission for years 2001-2004. A detailed description of this work in provided in CCSBT-ESC/0509/12 and only summarised here.

The key issue is the assignment of an age to a fish based on the zone counts, particularly for fish taken in the middle of the year. Almost all fish were found to have a wide margin. The age of these fish was assumed to be equal to the number of increments counted. For the small number of fish with a narrow margin the age assigned was equal to the number of increments minus 1. These assumptions result in length-at-age distributions which appear to be offset from the Scientific Committee 2001 growth curve by one year. For the data presented in the New Zealand National Fishery Report, we have added one year age estimates.

We are hoping that this issue will be addressed by the SAG/SC and anticipate that we will resubmit our direct ageing data based on an agreed protocol for assigning ages.

5 FUTURE WORK

The process of undertaking the Data Exchange a number of issues arose that may need further consideration, also we are undertaking a "data rescue" project that may lead to further improvements in our domestic data.

[2] The age data first submitted was based on an algorithm that kept fish on the upper bound in the younger age class.

In addition to any recommendations by the SAG/SC, we will be undertaking the following data-related tasks in the upcoming year:

- Develop raised length and age data for the early handline and troll fishery using the "DANSOL" data
- Develop raised length and age data for the two Philippines vessels for 2003 (note that catch is less that 20 fish and these are included in the catch statistics)
- Revisit the decision of using the larger of the raised catch and number observed – this will reduce the number of fish in the raised length and age data by minimal amount, and mostly for the domestic fleet
- Attempt to improve the historical domestic longline age and length composition data using fish processing records
- Revise the direct age estimates based on recommendations by the SAG/SC

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Annex 1: Summary of important grooming rules

Summarised below are the important automatic grooming rules which are applied to New Zealand's catch and effort data which were provided to CCSBT for this years Data Exchange.

PR1. Statistical Area
Stat: Set stat area to null if stat area is not a valid stat area, by valid we mean the stat areas in the General Statistical Areas.

PR2. Latitude and Longitude
POSERR: For a trip having more than or equal to 5 fishing positions (sets), firstly calculate average travelling speed and average travelling distances between each adjacent fishing positions. If both differences between a position's adjacent distances and its average travelling distances are more than 3 degrees, this position is thought to be wrong. If only one erroneous position found then use the middle position between the adjacent ones as correct position, otherwise mark the position as POSCHK in the memo field.

LAT: Set latitude to null if not between -25 to -60 degrees if stat area is valid.

LON: Set longitude to null if not between 160E to 170W degrees if stat area is valid.

POSCHK: if a position is not inside its stat area, flag the position as questionable but does nothing to fix.

CENTROID: Set latitude and longitude to that of centroid of stat area if latitude or longitude is null.

PR3. FMA
Set FMA according to latitude and longitude for start fishing position.
FMA: if FMA is 'NI' or 'SI' then set the FMA, latitude and longitude to null.

Other Rules

OR1. Tlset Date Time
SETEND: If datetime_set_end is before datetime_set_start, set it to null.
HAULSTART: If datetime_haul_start is before datetime_set_end or datetime_set_start, set it to null.
HAULEND: If datetime_haul_end is before datetime_haul_start, set it to null.

OR2. Sea Surface Temperature
SST: Set sea surface temperature to null if it's not between 10 to 30 degrees.

OR3. Species Code
SPNUL: Set species code to 'UNI' if species code is null.
SPUNI1: Re-assign species code to "UNI" if the species code is within the following list:
'AGR','BBA','BCO','BEN','BUT','CDL','DIS','DOS','ESQ','FBA','FRO','GSC','HAK','LEA','LIN','MAC','MDO','MIX','MOK','OFF','ORH','OTH','PIF','PMA','POP','RBY','RCO','RDO','REP','RSN','RUB','SEO','SKA','SKI','SLR','SPE','SQU','SSK','STA','SWA','TAR'.
SPUNI2: Re-assign species code to 'UNI' if the species code is within the following list: 'BMA', 'EMA', 'KAH', 'SNA', 'TRE' AND
For all longline catch effort records.
For landing/CELR effort and catch records where method is not 'PS' (Purse Seining).

SPSHA: Reassign species code to 'SHA' if the species code is within the following list: 'BSH','GSH','HHS','SEV','SOP','SPD'.

SPOFH: Reassign species code to 'OFH' if the species code is 'OIL'.

SPPOS: Reassign species code to ‘POS’ if the species code is ‘POR’.

SPDAS: Reassign species code to 'DAS' if the species code is 'RAY'.

SPSHF: Reassign species code to 'SHF' if the species code is 'SFN'.

Catch Effort Rules

The average catch weight per trip for CELR in the following text means “green weight / estimated catch number”.

CE1 Green Weight

GWCAL (Green Weight Calculation): If green weight is null use bin number X bin weight to get the green weight.

Fishing Method

MTHSLL: Set method to ‘SLL’ if fishing method for longline effort is null.

CE2. Fishing Effort

PSSET7 (BR2): For method ‘PS’ if number of sets per day > 7, set number of sets to null.

LONSET2 (BR17): For method ‘SLL’/’BLL’ if number of sets per day > 2, set number of sets to null.

50HK4000 (BR18): For method ‘SLL’/’BLL’ if number of hooks per set is not between 50 and 4000, set number of hooks to null.

CE3. Catch

NUMWGT (BR20ab): If total catch number per trip per species > 1000 or if no green weight is available and average catch number per species per record > 100, set the catch number to catch weight.

NUMWGT2(new) If the average catch weight fails the lower limit of the following rules and it is between 0.7 to 1.3 (the difference of estimated catch number and green weight is close to <= 30%), then set the estimated catch number to weight.

1PS160(BR1): For method ‘PS’ and vessel overall length <= 50m if estimated catch weight per set > 160t or < 1t, set the catch to null.

1PS350 (new): For method ‘PS’ and vessel overall length > 50m if estimated catch weight per set > 350t or < 1t, set the catch to null.

ALB300 (BR3): For method ‘T’/‘PL’ and species ‘ALB’ if catch number per day > 300, set catch number to weight.

ALB2000 (BR4): For method ‘T/PL’ and species ‘ALB’ if catch number per trip > 2000, set catch number to weight.

ALB10 (BR5): For method ‘T/PL’ and species ‘ALB’ if green weight per trip > 10t, set green weight to null.

2ALB20(BR6): For method ‘T/PL’ and species ‘ALB’ if average catch weight <2 kg or > 20 kg, firstly apply rule NUMWGT2, if not applicable then set the green weight and catch number to null.

1SKJ16(BR7): For method 'T/PL' and species 'SKJ' if average catch weight < 1.2kg or > 16 kg, firstly apply rule NUMWGT2, if not applicable then set the green weight and catch number to null.

10SBT225(BR8): For method 'T/PL' and species 'SBT' if average catch weight < 10 kg or > 225 kg, firstly apply rule NUMWGT2, if not applicable then set the green weight and catch number to null.

25NTUTOR350(BR9): For method 'T/PL' and species in ('NTU', 'TOR') if average catch weight < 25 kg or > 350 kg, firstly apply rule NUMWGT2, if not applicable then set the green weight and catch number to null.

1YFN70(BR10): For method 'T/PL' and species 'YFN' if average catch weight < 1.2 kg or > 70 kg, firstly apply rule NUMWGT2, if not applicable then set the green weight and catch number to null.

2ALB45 (BR11): For method in ('HL', 'SLL', 'BLL','DL','TL') and species 'ALB' if average catch weight < 2 kg or > 45 kg, firstly apply rule NUMWGT2, if not applicable then set the green weight and catch number to null; for TLCER form set catch to null.

15BIG210(BR12): For method in ('HL', 'SLL', 'BLL','DL','TL') and species 'BIG' if average catch weight < 15 kg or > 210 kg, firstly apply rule NUMWGT2, if not applicable then set the green weight and catch number to null; for TLCER form set catch to null.

25NTUTOR350(BR13): For method in ('HL', 'SLL', 'BLL','DL','TL') and species in ('NTU','TOR') if average catch weight < 25 kg or > 350 kg, firstly apply rule NUMWGT2, if not applicable then set the green weight and catch number to null; for TLCER form set catch to null.

10SBT250 (BR15): For method in ('HL', 'SLL', 'BLL','DL','TL') and species 'SBT' if average catch weight < 10 kg or > 250 kg, firstly apply rule NUMWGT2, if not applicable then set the green weight and catch number to null; for TLCER form set catch to null.

7SWO650 (BR16): For method in ('HL', 'SLL', 'BLL','DL','TL') and species 'SWO' if average catch weight < 7 kg or > 650 kg, firstly apply rule NUMWGT2, if not applicable then set the green weight and catch number to null; for TLCER form set catch to null.

10YFN200 (BR14): For method in ('HL', 'SLL', 'BLL','DL','TL') and species 'YFN' if average catch weight < 10 kg or > 200 kg, firstly apply rule NUMWGT2, if not applicable then set the green weight and catch number to null; for TLCER form set catch to null.

SKJ3 (BR19):): For method 'PS' and species 'SKJ' if the ratio of green weight over estimated catch weight > 3 set the catch to null.

Annex 2: Summary of scripts used in providing raised catch at length and age data

Converting length to age

```
lentoage <- function(Data)
{
#From charterlen2age2
#Version 3 27/7/05
#puts fish on cutoff up rather than down
#uses the julian day for the middle of the month (ndays/2)

lage <- ncol(agecut)-1
tmp3 <- rep(0,lage)
Data$Age <- rep(NA,nrow(Data))
Data$Flength <- Data$length

#Need an ifelse statement for month - set to 6 if NA
tmpmon <- ifelse(is.na(Data$Month),6,Data$Month)

#New code to turn month into a day of the year
#Number of days in each month
mdays <- c(31,28,31,30,31,30,31,31,30,31,30,31)
tmpdays <- mdays[tmpmon]
midjune <- sum(mdays[1:6])-(mdays[6]/2)

    for(i in 1:nrow(Data))
    {
    #dayofyear <- round(julian(d=tmpdays[i]/2,m=tmpmon[i],y=Data$Year[i],origin=c(1,1,Data$Year[i]))/365,3)
    dayofyear <- round(midjune/365,3)
    #if(i==1)browser()
    xxx <- match(Data$Year[i],agecut[,1])
    tmp <- agecut[xxx:(xxx+1),-1]
    tmp1 <- as.vector(unlist(tmp[1,]))
    tmp2 <- as.vector(unlist(tmp[2,]))

    #Original code
    #tmp3[1:lage-1] <- as.vector(tmp1[1:lage-1] + ((tmp2[2:lage]-tmp1[1:lage-1])*((tmpmon[i]-0.5)/12)))
    #tmp3[lage] <- tmp1[lage] + ((tmp2[lage]-tmp1[lage])*((tmpmon[i]-0.5)/12))
```

```
    #New code based on day of the year cutoff - 8/6/05
    tmp3[1:lage-1] <- as.vector(tmp1[1:lage-1] + ((tmp2[2:lage]-tmp1[1:lage-1])*dayofyear))
    tmp3[lage] <- tmp1[lage] + ((tmp2[lage]-tmp1[lage])*dayofyear)

        #if(i==1 | i==22) {browser()}
    #options(expressions=525)
    Data$Age[i]<- ifelse(Data$Flength[i]<tmp3[1],0,
        ifelse(Data$Flength[i]>=tmp3[1] & Data$Flength[i]<tmp3[2],1,
        ifelse(Data$Flength[i]>=tmp3[2] & Data$Flength[i]<tmp3[3],2,
        ifelse(Data$Flength[i]>=tmp3[3] & Data$Flength[i]<tmp3[4],3,
        ifelse(Data$Flength[i]>=tmp3[4] & Data$Flength[i]<tmp3[5],4,
        ifelse(Data$Flength[i]>=tmp3[5] & Data$Flength[i]<tmp3[6],5,
        ifelse(Data$Flength[i]>=tmp3[6] & Data$Flength[i]<tmp3[7],6,
        ifelse(Data$Flength[i]>=tmp3[7] & Data$Flength[i]< tmp3[8],7,
        ifelse(Data$Flength[i]>=tmp3[8] & Data$Flength[i]< tmp3[9],8,
        ifelse(Data$Flength[i]>=tmp3[9] & Data$Flength[i]< tmp3[10],9,
        ifelse(Data$Flength[i]>=tmp3[10] & Data$Flength[i]< tmp3[11],10,
        ifelse(Data$Flength[i]>=tmp3[11] & Data$Flength[i]< tmp3[12],11,
        ifelse(Data$Flength[i]>=tmp3[12] & Data$Flength[i]< tmp3[13],12,
        ifelse(Data$Flength[i]>=tmp3[13] & Data$Flength[i]< tmp3[14],13,
        ifelse(Data$Flength[i]>=tmp3[14] & Data$Flength[i]< tmp3[15],14,
        ifelse(Data$Flength[i]>=tmp3[15] & Data$Flength[i]< tmp3[16],15,
        ifelse(Data$Flength[i]>=tmp3[16] & Data$Flength[i]< tmp3[17],16,
        ifelse(Data$Flength[i]>=tmp3[17] & Data$Flength[i]< tmp3[18],17,
        ifelse(Data$Flength[i]>=tmp3[18] & Data$Flength[i]< tmp3[19],18,
        ifelse(Data$Flength[i]>=tmp3[19] & Data$Flength[i]< tmp3[20],19,
        ifelse(Data$Flength[i]>=tmp3[20] & Data$Flength[i]< tmp3[21],20,
        ifelse(Data$Flength[i]>=tmp3[21] ,21,NA))))))))))))))))))))))
    }
return(Data)
}
```