Evaluation of daily and annual increment counts from pairs of bigeye otoliths from the WCPO

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CSIRO

WCPO BET ageing history (CSIRO/SPC)

| Year	Project	Publication
1990s	SPC daily ageing and tagging data (SPC) VB composite model	Lehodey & Leroy (1999)
1990s - early 2000s	Sr-marking experiment - daily & annual age validation) (CSIRO/SPC)	Clear et al. (2000)
2000s	Australian AFZ age & growth study (CSIRO/SPC)	Farley et al. (2006)
2009-2011	WCPFC pilot project (SPC/CSIRO/FAS) Preliminary growth curve	Nicol et al. (2011)
2012-2017	Full project (CSIRO/FAS/SPC) Daily-annual age comparison study	Farley et al. (2017) Williams et al. (2013)
2018	Updated growth (CSIRO/FAS/SPC/NRIFSF)	Farley et al. (2018)

Comparison of daily- and annual- increment counts in otoliths of bigeye (*Thunnus obesus*), yellowfin (*T. albacares*), southern bluefin (*T. maccoyii*) and albacore (*T. alalunga*) tuna

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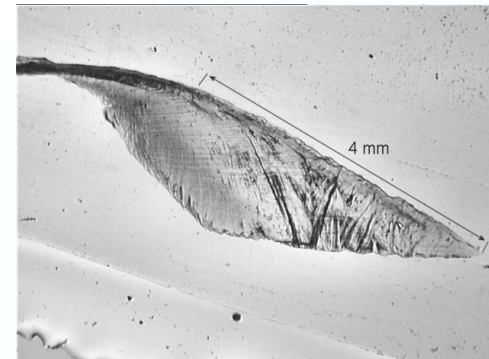
Sectioning planes
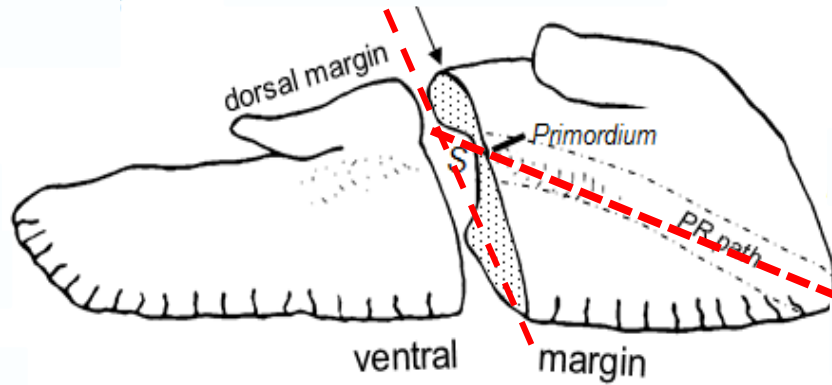
Transverse section
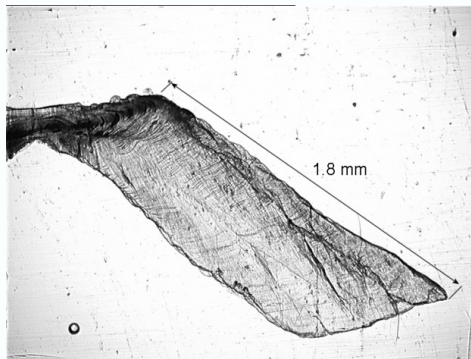
Daily age
Annual age

Frontal (longitudinal) section

Daily age

Otolith images from Williams et al. (2013).

Readers: CSIRO (Annual) SPC/FAS (daily)

Table 2. Design matrix for four otolith readers (R1–R4) using three methods to estimate age for four tuna species.

| Species | Age estimation method | | |
	DT	DL	AT
Bigeye	R1 (R2)	R1 (R2)	R3, R4
Yellowfin	R1 (R2)	R1 (R2)	R3, R4
Southern bluefin	R2 (R1)	R2 (R1)	R3, R4
Albacore	R2 (R1)	R2 (R1)	R3, R4

Otolith reader in brackets read a subsample. AT = Annual counts from transverse sections, DL = daily counts from longitudinal sections, DT = daily counts from transverse sections.

Size range analysed

Table 1. Number of otoliths selected from four tuna species by length class.

| Fork length (cm)	Albacore	Bigeye	Southern bluefin	Yellowfin
40 – 49	3		2	3
50 – 59	4	3	2	3
60 – 69	4	3		3
70 – 79	4	3	3	3
80 – 89	4	3	2	3
90 – 99	4	4	3	3
100 – 109	4	3	3	3
110 – 119	3	5	3	3
120 – 129		5	3	3
130 – 139		3		3
140 – 149		1		
150 – 159		1	2	
160 – 169			2	
170 – 179		1	2	
180 – 189			2	
190 – 199			1	
Total	30	35	30	30

Age bias plots
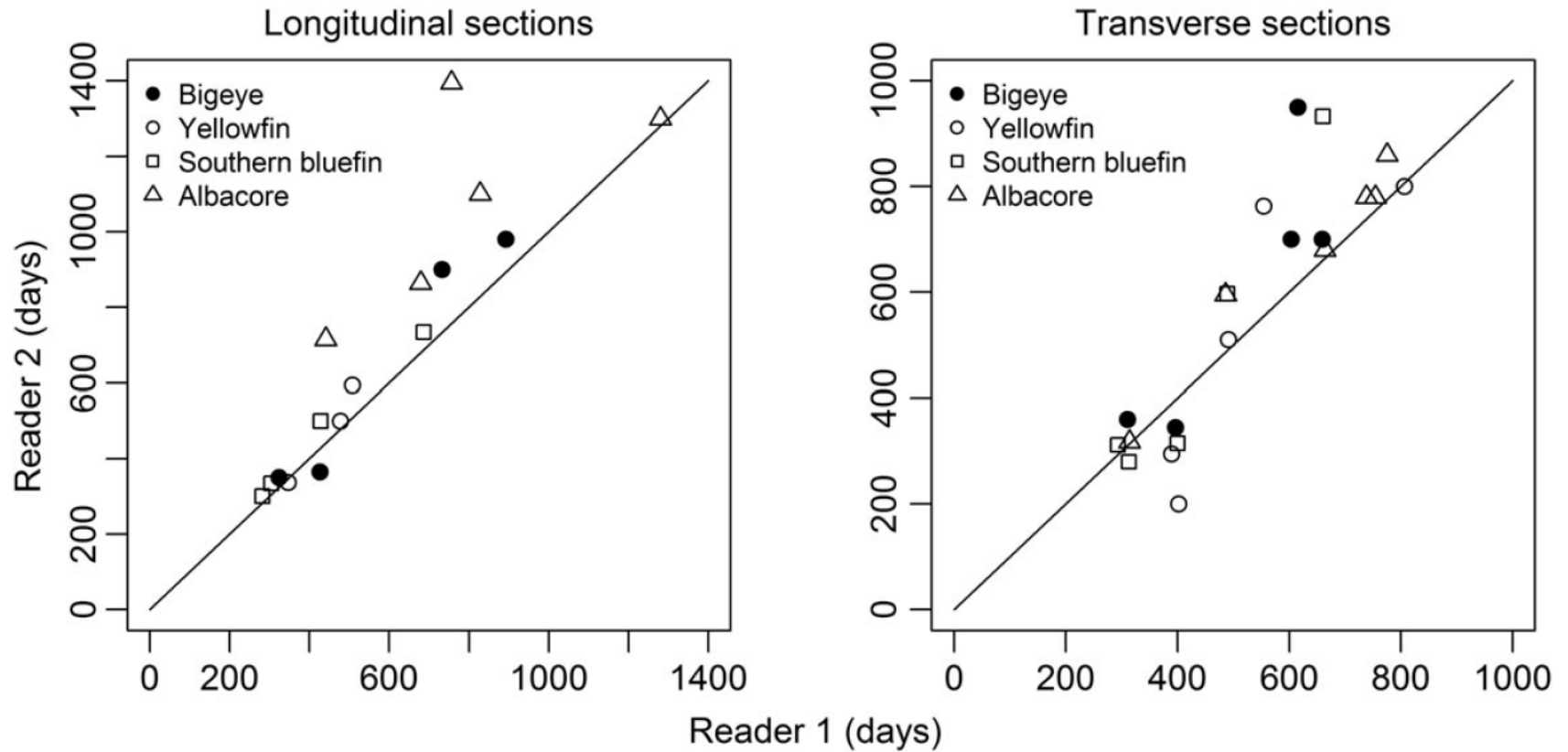
Figure 5. Age bias plots comparing daily-age estimates from two readers and two age estimation methods (longitudinal and transverse sections) for four tuna species.

Age bias plots

Bigeye
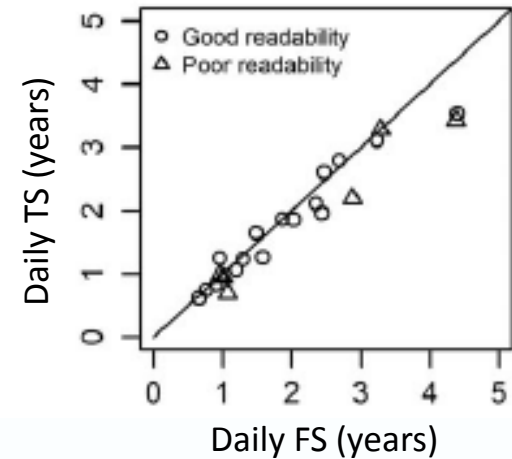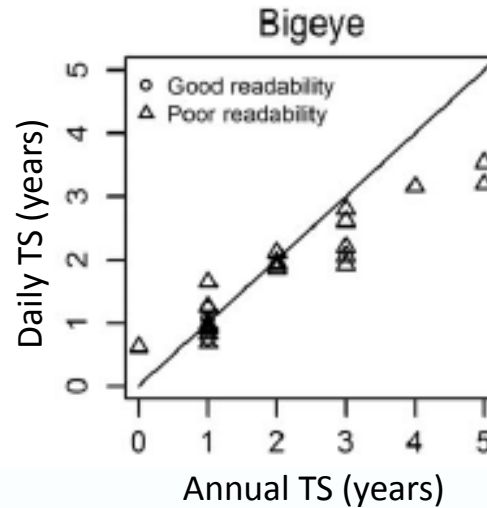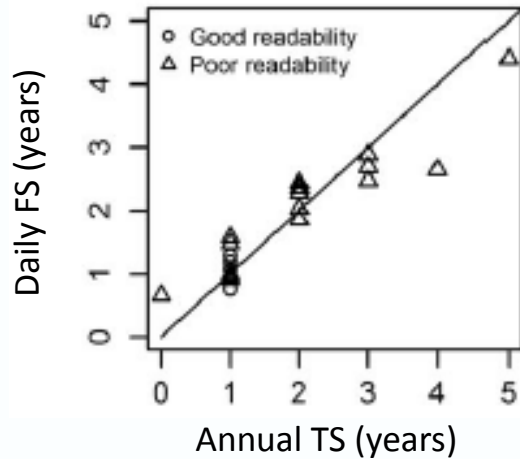
- Annual counts were generally higher daily age in both TS & FS for fish older than two years.
- Daily age of a 14 yo could not be obtained (175 cm)

FAS
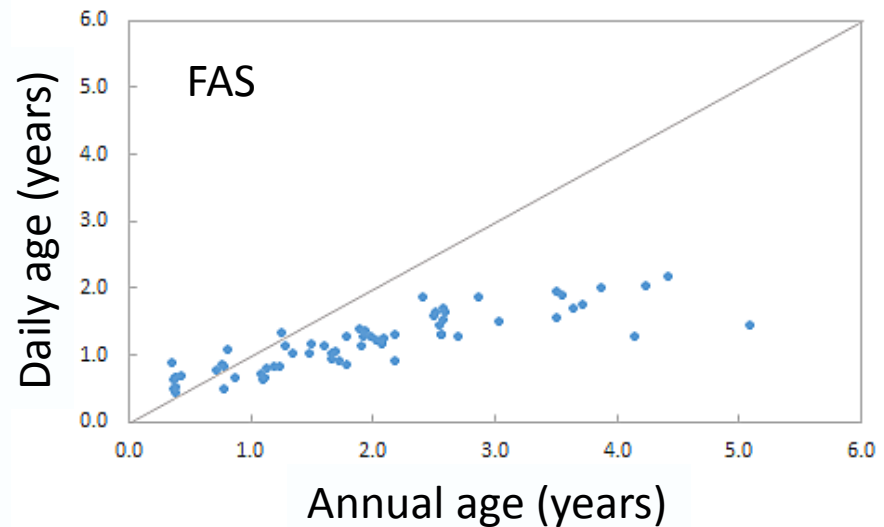
Further work

- Inter-lab ageing exercise to compare ageing methods
  - Particularly daily ageing