Tables

Table 1: Terms used throughout this paper and to classify components of lifespan validated in age determination studies. An example of each term is given for New Zealand porbeagle sharks (Francis *et al.* 2007).

Term	Description	NZ Porbeagle
Maximum validated age	The oldest individual for which growth zones have been validated. Or, where age underestimation is reported, the age to which growth zone counts are seemingly valid	20 years
Apparent longevity	The oldest individual based on unvalidated growth zone counts	38 years
True longevity	The minimum longevity of the species where age has been shown to be underestimated, and where it exceeds maximum apparent age	65 years
Validated ages	The ages over which growth zones have been confirmed to be a reliable indicator of age	0 - 20 years
Uncertain ages	Any ages for which growth zones have yet to be validated. Also, where age underestimation occurs, the ages between the maximum validated age and the apparent longevity, which are effectively uncertain unless age underestimation is corrected for	20 - 38 years
Underestimated ages	The difference between true longevity and apparent longevity	38 - 65 years

Table 2: Evidence for age underestimation in bomb carbon dating and chemical marking age validation studies of sharks and rays. n is sample size, A_{Max} is longevity, Δ_{Mean} and Δ_{Max} are the mean and maximum differences between true and apparent age in individuals where age underestimation was detected. Regions: AUS/NZ - Australia and New Zealand; NEA - northeast Atlantic; NEP - northeast Pacific; NWA - northwest Atlantic; SA - South Africa.

Species	Region	n	Validated ages (yrs)	Apparent A_{Max} (yrs)	True A_{Max} (yrs)	Δ_{Mean} (yrs)	Δ_{Max} (yrs)	Evidence	Rationale
Method: Bomb carbon dating									
Alopias vulpinus [16]	NWA	3	0-14	20	38	10	18	Likely	Phase-shifted ^{14}C signature
Carcharadon carcharias [9]	NWA	8	0-44	52	73	14	21	Likely	Phase-shifted ^{14}C signature
Carcharadon carcharias [1]	NEP	8	0-7	18	37	12	20	Likely	Phase-shifted ^{14}C signature. Re-analysis of Kerr *et al.* (2006)
Carcharhinus obscurus [15]	NWA	8	0-11	23	42	17	19	Likely	Phase-shifted ^{14}C signature
Carcharhinus plumbeus [2]	NWA	5	0-10	27	33	8	11	Likely	Phase-shifted ^{14}C signature
Carcharias taurus [17]	NWA	8	0-12	22	34	12	12	Likely	Phase-shifted ^{14}C signature
Carcharias taurus [17]	SA	2	0-14	23	40	19	20	Likely	Phase-shifted ^{14}C signature
Galeocerdo cuvier [12]	NWA	4	0-20	22				Possible	Phase-shift noted in one specimen, attributed to ontogenetic diet and depth changes
Galeorhinus galeus [11]	AUS/NZ	9	0-14	20	42	9	18	Likely	Phase-shifted ^{14}C signature
Isurus oxyrinchus [3]	NWA	8	0-31	31				Possible	Phase-shift noted in one specimen, attributed to methodological error
Lamna nasus [7]	AUS/NZ	11	0-20	38	65	22	34	Likely	Phase-shifted ^{14}C signature
Leucoraja ocellata [13]	NWA	13	0-23	23	28	5	5	Likely	Phase-shifted ^{14}C signature
Squalus suckleyii [4]	NEP	13	0-52	80				Possible	Phase-shift noted in at least one specimen, attributed to methodological error
Method: Chemical marking									
Carcharhinus melanopterus [5]	AUS/NZ	11	0-8	15		3	3	Likely	Recapture did not form expected number of growth zones
Carcharhinus sorrah [10]	AUS/NZ	8		13		2	2	Likely	Recapture did not form expected number of growth zones. Calcein did not mark pregnant females.
Carcharhinus tilstoni [10]	AUS/NZ	1		15		3	3	Likely	Recapture did not form expected number of growth zones
Carcharhinus tilstoni [6]	AUS/NZ	10	0-3	12	18			Possible	Long-term recapture suggested greater longevity than growth zone counts
Galeorhinus galeus [19]	AUS/NZ	18	0-11	20	42			Likely	Frequency of growth zones in sharks >1400mm (mean age 11) was significantly < 1
Neotrygon kuhlii [18]	AUS/NZ	3	1-5	13		2	2	Likely	Recapture did not form expected number of growth zones
Raja erinacea [14]	NWA	13	5-11	11				Possible	Annual growth zones may cease when females reproductively active
Sphyrna tiburo [8]	NWA	24	0-10.5	18		2	2	Likely	Recapture did not form expected number of growth zones. Long-term recapture suggested greater longevity than growth zones counts.

[1]Andrews and Kerr (2015); [2]Andrews *et al.* (2011); [3]Ardizzone *et al.* (2006); [4]Campana *et al.* (2006); [5]Chin *et al.* (2013); [6]Davenport and Stevens (1988) [7]Francis *et al.* (2007); [8]Frazier *et al.* (2014); [9]Hamaday *et al.* (2014); [10]Harry *et al.* (2013); [10]Harry *et al.* (2013); [11]Kalish and Johnston (2001) [12]Kneebone *et al.* (2008); [13]McPhie and Campana (2009); [14]Natanson (1993); [15]Natanson *et al.* (2014); [16]Natanson *et al.* (2016); [17]Passerotti *et al.* (2014) [17]Passerotti *et al.* (2014); [18]Pierce and Bennett (2009); [19]Walker *et al.* (2001)

Table 3: Best fit parameters (β_1 and β_2), standard errors (S.E.), and negative log likelihood, (LL) for logistic regression models of incidence of age underestimation as function of relative length and age.

	β_1	S.E.	β_2	S.E.	LL
Length	-36.07	13.06	41.02	14.52	-8.90
Age	-6.14	1.80	15.06	4.56	-10.87