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Skeletochronological Age Estimates for Hawaiian Green Turtles

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Age estimates of Hawaiian *Chelonia mydas* indicate that turtles resident to different foraging pastures may reach adult size at significantly different ages (Balazs 1980). These age estimates were derived entirely from growth rates of wild animals recaptured one or more times. An independent method of age estimation seemed desirable to test the estimates derived from growth data. The tentative success of the skeletochronological technique (Zug et al. 1983, in press) offered such an opportunity.

Humeri were available from 10 Hawaiian *Chelonia* that died from various causes over the past 9 years, and a single green turtle from Canton Island (lat. 2° 50'S, long. 171° 43'W) in the Phoenix Group. More humeri are currently being obtained for additional analysis. The bones were prepared and examined as outlined in Zug et al. (1983). The skeletochronological age estimates were made without knowledge of age or specific provenance of the specimens.

Of the 11 specimens, minimum age could be estimated for 9 (Table 1). The bone sections from the remaining two were homogenous in appearance and had no evidence of periosteal laminae (cyclic marks of skeletal growth, MSG's). We can offer no satisfactory explanation for the absence of MSG's, but their absence is observed in other reptiles (*Caretta*, *Iguana*) (Zug, unpubl. obs.). The number of MSG's visible in bone sections of the other *Chelonia* ranges from 1 to 16 (median 3; mean 4.6).

Age estimates from sections with few MSG's would be less reliable than estimates from sections with numerous MSG's. In general, the extreme - low and high - estimates are associated with few MSG's per section. The linear regression for the entire Hawaiian sample is $Y = 52.03 + 0.329X$ ($r = 0.66$) and for this sample without the centenarian $Y = 40.69 + 0.746X$ ($r = 0.92$), where Y is carapace length in centimeters and X is age in years. Thus, only the 135-yr estimate deviates strongly from the other estimates.

Table 1. Body dimensions and age estimates of *Chelonia mydas*. Abbreviations: CL, carapace length, straight line; HL, maximum length of humerus; M & F, male and female; Sk and K, age estimates from skeletochronology and known age, respectively.

Age Estimates					
CL	HL	Sex	Sk	K	Provenance
Oahu Island					
33.6	6.3	?	?	2	Lanikai
45.1	8.7	?	(4)		Reef Runway

54.0	11.4	?	18		Bellows
74.8	15.6	M	(135)		Barbers Point
88.8	19.4	F	43		Kaneohe Bay
92.7*	19.3	M	81		Bellows
93.0	19.2	F	(66)		Waikiki
Hawaii Island					
39.4	8.0	?	(17)		Kau District
52.4	11.1	?	13		Kau District
Northwestern Hawaiian Islands					
41.0	7.6	?	?		French Frigate Shoals
Phoenix Group					
90.0	20.2	F	15		Canton Island

*The only over-the-curve carapace length measurement.

() Age estimated from one or two MSG's

Although these age estimates are most tentative, they suggest several general observations. Mark and recapture growth data indicate that the Kau turtles grow considerably faster than the Oahu turtles (Balazs 1982); the skeletochronological estimates suggest slow growth and late maturity for turtles at both locations. If sexual maturity occurs at carapace length greater than 81 cm, Hawaiian turtles may require 40-50 yr to reach that size. The Canton Island turtle derives from considerably warmer waters and its estimated age indicates much faster growth and earlier maturity.

Balazs, G. H. 1980. Synopsis of biological data on the green turtle in the Hawaiian Islands. US Dep. Commer., NOAA Tech. Memo. NMFS, NOAA-TM-NMFS-SWFC-7, 141p.

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Zug, G. R., A. Wynn and C. Ruckdeschel. In press. Age determination of loggerhead sea turtles, *Caretta caretta*, by incremental growth marks in the skeleton. Smithsonian Contrib. Zool.