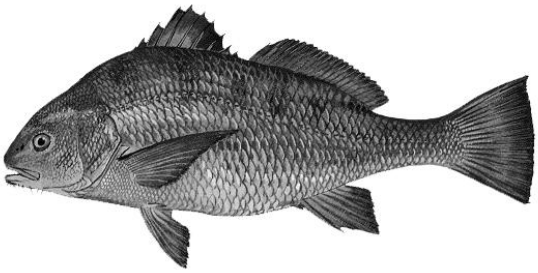
Chapter 2
Black Drum



Pogonias cromis

INTRODUCTION

A total of 233 black drum, *Pogonias cromis*, were collected by the VMRC's Biological Sampling Program for age and growth analysis in 2008. The average age of the sample was 28 years, with a standard deviation of 14.9 and a standard error of 0.98. Forty-nine age classes were represented with the youngest age of 0 and the oldest age of 56 years, comprising fish from the earliest year-class of 1952 to the most recent year-class of 2008.

METHODS

Handling of collection — Sagittal Otoliths (hereafter, refer to as "otoliths") were received by the Age & Growth Laboratory in labeled coin envelopes. In the lab they were sorted by date of capture, their envelope labels were verified against VMRC's collection data, and each fish was assigned a unique Age and Growth Laboratory identification number. All otoliths were stored dry in their original labeled coin envelopes.

Preparation — Otoliths were processed for age determination following the methods described in Bobko (1991) and Jones and Wells (1998). The left or right sagittal otolith was randomly selected and attached, distal side down, to a glass slide with Crystalbond™ 509 adhesive. The otoliths were viewed by eye, and when necessary, under a stereo microscope to identify the location of the core, and the position of the core marked using a pencil across the otolith surface. At least one transverse cross-section (hereafter "thin-section) was then removed from the marked core of each otolith using a Buehler® IsoMet™ low-speed saw equipped with two, three inch diameter, Norton® Diamond Grinding Wheels, separated by a stainless steel spacer of 0.4mm (diameter 2.5"). The position of the marked core fell within the 0.4mm space between the blades, such that the core was included in the thin-section removed. Otolith thin-sections were placed on labeled glass slides and covered with a thin layer of Flo-texx® mounting medium that not only adhered the sections to the slide, but more importantly, provided enhanced contrast and greater readability by increasing light transmission through the sections.

Readings — The CQFE system assigns an age class to a fish based on a combination of reading the information contained in its otolith, the date of its capture, and the species-specific period when it deposits its annulus. Each year, as the fish grows, its otoliths grow and leave behind markers of their age, called annuli. Technically, an otolith annulus is the combination of both the opaque and the translucent bands. In practice, only the opaque bands are counted as annuli. The number of these visible dark bands replaces "x" in our

notation, and is the initial "age" assignment of the fish.

Second, the otolith section is examined for translucent growth. If no translucent growth is visible beyond the last dark annulus, the otolith is called "even" and no modification of the assigned age is made. The initial assigned age, then, is the age class of the fish. Any growth beyond the last annulus can be interpreted as either being toward the next age class or within the same age class. If translucent growth is visible beyond the last dark annulus, a "+" is added to the notation.

By convention all fish in the Northern Hemisphere are assigned a birth date of January 1. In addition, each species has a specific period during which it deposits the dark band of the annulus. If the fish is captured after the end of the species specific annulus deposition period and before January 1, it is assigned an age class notation of "x + x", where "x" is the number of dark bands in the otolith.

If the fish is captured between January 1 and the end of the species specific annulus deposition period, it is assigned an age class notation of "x + (x+1)". Thus, any growth beyond the last annulus, after its "birthday" but before the dark band deposition period, is interpreted as being toward the next age class.

For example, black drum otolith deposition occurs from May through June (Beckman et al. 1990; Jones and Wells 1997). A black drum captured between January 1 and June 30, before the end of the species' annulus formation period, with three visible annuli and some translucent growth after the last annulus, would be assigned an age class of "x + (x+1)" or 3 + (3+1), noted as 3 + 4. This is the same age-class assigned to a fish with four visible annuli captured after the end of June 30, the period of annulus formation, which would be noted as 4 + 4.

All thin-sections were aged by two different readers using a Nikon SMZ1000 stereo microscope under transmitted light and dark-field polarization at between 8 and 20 times magnification (Figure 1). Each reader aged all of the otolith samples.

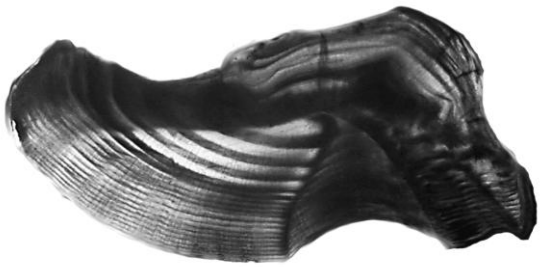


Figure 1. Otolith thin-section from a 20 vear-old black drum.

All samples were aged in chronological order, based on collection date, without knowledge of previously estimated ages or the specimen lengths. When the readers' ages agreed, that age was assigned to the fish. When the two readers disagreed, both readers sat down together and re-aged the fish, again without any knowledge of previously estimated ages or lengths, and assigned a final age to the fish. When the readers were unable to agree on a final age, the fish was excluded from further analysis.

Comparison Tests — A symmetric test (Hoenig et al. 1995) and coefficient of variation (CV) analysis were used to detect any systematic difference and precision on age readings, respectively, for following comparisons: 1) between the two readers in the current year, 2) within each reader in the current year, and 3)

time-series bias between the current and previous years within each reader. The readings from the entire sample for the current year were used to examine the difference between two readers. A random sub-sample of 50 fish from the current year was selected for second readings to examine the difference within a reader. Fifty otoliths randomly selected from fish aged in 2000 were used to examine the time-series bias within each reader. A figure of 1:1 equivalence was used to illustrate those differences (Campana et al. 1995). All statistics analyses and figures were made using R (R Development Core Team 2009).

RESULTS

The measurement of reader self-precision was very high for both readers. There is no significant difference between the first and second readings for Reader 1 with a CV = 0.6% and an agreement of 80% (test of symmetry: $\chi^2 = 10$, df = 10, $P = 0.4405$). There is no significant difference between the first and second readings for Reader 2 with a CV = 0.6% and an agreement of 74% (test of symmetry: $\chi^2 = 10.33$, df = 11, $P = 0.5007$). There was no evidence of systematic disagreement between Reader 1 and Reader 2 with an agreement of 82.4% and a CV of 0.5% (test of symmetry: $\chi^2 = 34.33$, df = 28, $P = 0.1901$) (Figure 2).

Reader 1 had an agreement of 72% with ages of fish aged in 2000 with a CV of 0.7% (test of symmetry: $\chi^2 = 12$, df = 13, $P = 0.5276$). Reader 2 had an agreement of 72% with ages of fish aged in 2000 with a CV of 1.6% (test of symmetry: $\chi^2 = 14$, df = 12, $P = 0.3007$).

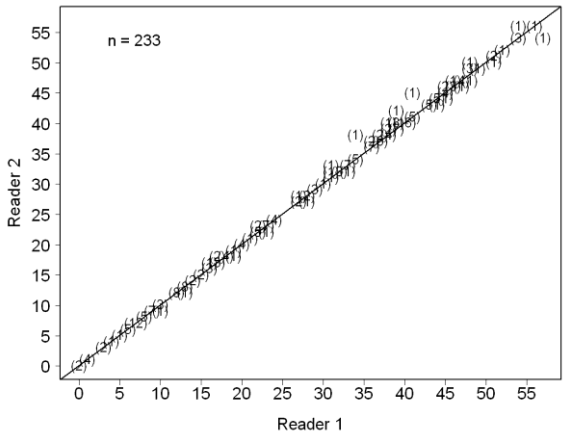


Figure 2. Between-reader comparison of otolith age estimates for black drum collected in Chespakead Bay and Virginia waters of Atlantic in 2008.

Of the 233 fish aged with otoliths, 49 age classes were represented (Table 1). The average age of the sample was 28 years, with a standard deviation of 14.9 and a standard error of 0.98. The youngest fish was a 0 year old and the oldest fish was 56 years old, representing the year-classes as early as 1952 and as late as 2008 (Figure 3).

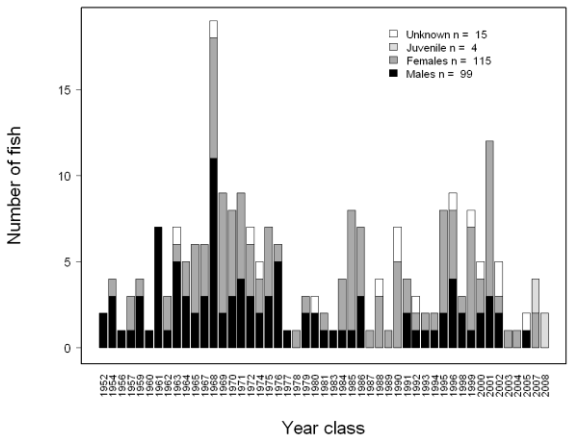


Figure 3. Year-class frequency distribution for black drum collected for ageing in 2008. Distribution is broken down by sex. "Unknown" is used for specimen that were not eligible for gonad extraction, or, during sampling, the sex was not examined.

Age-Length-Key — We present an age-length-key (Table 2) that can be used in the conversion of numbers-at-length in the estimated catch to numbers-at-age using otolith ages. The table is based on VMRC's stratified sampling of landings by total length inch intervals.

REFERENCES

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Table 1. The number of black drum assigned to each total length (inch)-at-age category for 233 fish sampled for otolith age determination in Virginia during 2008.

Interval	Age																								
	0	**1**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**27**
7 - 7.99	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 8.99	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16 - 16.99	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18 - 18.99	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19 - 19.99	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20 - 20.99	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22 - 22.99	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23 - 23.99	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29 - 29.99	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31 - 31.99	0	0	0	0	0	1	4	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32 - 32.99	0	0	0	0	0	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33 - 33.99	0	0	0	0	0	1	3	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34 - 34.99	0	0	0	0	0	0	2	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35 - 35.99	0	0	0	0	0	0	0	2	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
36 - 36.99	0	0	0	0	0	0	2	1	2	0	3	0	0	0	0	0	0	0	0	1	0	0	0	0	0
37 - 37.99	0	0	0	0	0	0	0	0	0	2	2	3	0	0	0	0	0	0	1	0	0	0	0	0	0
38 - 38.99	0	0	0	0	0	0	0	0	0	1	0	0	2	0	1	0	1	0	1	0	0	0	0	0	0
39 - 39.99	0	0	0	0	0	0	0	0	0	0	3	1	0	1	1	0	1	0	1	0	0	0	0	0	0
40 - 40.99	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	1	1	0	0	1	0	0	0	0
41 - 41.99	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	2	2	0	0	0
42 - 42.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	1	2	1	0	0
43 - 43.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	1	0	1	0	2	0	0
44 - 44.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0	0
45 - 45.99	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	3	0	0	1
46 - 46.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0
47 - 47.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48 - 48.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
49 - 49.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50 - 50.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
51 - 51.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
52 - 52.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53 - 53.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	2	4	2	1	1	5	12	5	8	3	9	8	2	2	3	4	7	1	4	1	7	8	4	1	2

Table 1. (continued)

Interval	Age																								
	28	29	30	31	32	33	34	36	37	38	39	40	41	43	44	45	46	47	48	49	51	52	54	56	Totals
7 - 7.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
8 - 8.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
16 - 16.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
18 - 18.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
19 - 19.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
20 - 20.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
22 - 22.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
23 - 23.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
29 - 29.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
31 - 31.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
32 - 32.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
33 - 33.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
34 - 34.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
35 - 35.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
36 - 36.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	10
37 - 37.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
38 - 38.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
39 - 39.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
40 - 40.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
41 - 41.99	1	0	0	0	0	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	10
42 - 42.99	1	0	0	0	0	2	1	0	2	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	15
43 - 43.99	0	1	0	0	0	1	1	2	0	1	3	1	0	1	0	1	0	0	0	0	0	0	0	0	19
44 - 44.99	0	1	0	0	1	0	0	2	2	0	1	0	1	1	0	0	1	0	0	0	0	0	1	0	14
45 - 45.99	0	1	0	1	1	1	1	0	0	2	3	4	0	0	1	0	0	0	1	1	0	0	0	0	22
46 - 46.99	1	0	0	0	0	1		1	1	1	1	2	1	1	1	2	0	0	0	0	0	0	0	1	17
47 - 47.99	0	0	0	0	2	0	1	0	2	3	1	4	1	0	2	0	1	2	0	1	0	0	1	0	21
48 - 48.99	0	0	1	0	1	0	0	0	1	0	0	6	1	2	0	3	1	1	0	0	0	0	1	1	20
49 - 49.99	0	0	0	0	1	1	0	1	1	0	0	0	1	1	0	1	0	1	0	0	1	0	0	0	9
50 - 50.99	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0	0	1	1	0	0	5
51 - 51.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	0	0	0	3
52 - 52.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
53 - 53.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Totals	3	3	1	1	6	7	5	7	9	8	9	19	6	6	5	7	3	7	1	4	3	1	4	2	233

Table 2. Age-Length key, as proportion-at-age in each 1-inch length interval, based on otolith ages for black drum sampled for age determination in Virginia during 2008.

Interval	Age																
	0	**1**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
7 - 7.99	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 8.99	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16 - 16.99	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18 - 18.99	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19 - 19.99	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20 - 20.99	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22 - 22.99	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
23 - 23.99	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29 - 29.99	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
31 - 31.99	0	0	0	0	0	0.167	0.667	0	0.167	0	0	0	0	0	0	0	0
32 - 32.99	0	0	0	0	0	0.6	0.2	0.2	0	0	0	0	0	0	0	0	0
33 - 33.99	0	0	0	0	0	0.143	0.429	0.143	0.286	0	0	0	0	0	0	0	0
34 - 34.99	0	0	0	0	0	0	0.5	0	0.25	0	0.25	0	0	0	0	0	0
35 - 35.99	0	0	0	0	0	0	0	0.4	0.4	0	0	0.2	0	0	0	0	0
36 - 36.99	0	0	0	0	0	0	0.2	0.1	0.2	0	0.3	0	0	0	0	0	0
37 - 37.99	0	0	0	0	0	0	0	0	0	0.25	0.25	0.375	0	0	0	0	0
38 - 38.99	0	0	0	0	0	0	0	0	0	0.167	0	0	0.333	0	0.167	0	0.167
39 - 39.99	0	0	0	0	0	0	0	0	0	0	0.375	0.125	0	0.125	0.125	0	0.125
40 - 40.99	0	0	0	0	0	0	0	0	0	0	0	0.286	0	0	0	0.286	0.143
41 - 41.99	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0.1
42 - 42.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2
43 - 43.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.053	0.105	0
44 - 44.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45 - 45.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0.045	0	0	0
46 - 46.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
47 - 47.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48 - 48.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
49 - 49.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50 - 50.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
51 - 51.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
52 - 52.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53 - 53.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 2. (continued)

Interval	Age															
	19	20	21	22	23	24	25	27	28	29	30	31	32	33	34	36
7 - 7.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 8.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16 - 16.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18 - 18.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19 - 19.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20 - 20.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22 - 22.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23 - 23.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29 - 29.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31 - 31.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32 - 32.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33 - 33.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34 - 34.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35 - 35.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36 - 36.99	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0
37 - 37.99	0	0.125	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38 - 38.99	0	0.167	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39 - 39.99	0	0.125	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40 - 40.99	0.143	0	0	0.143	0	0	0	0	0	0	0	0	0	0	0	0
41 - 41.99	0	0	0	0.2	0.2	0	0	0	0.1	0	0	0	0	0.1	0	0
42 - 42.99	0	0	0	0.067	0.133	0.067	0	0	0.067	0	0	0	0	0.133	0.067	0
43 - 43.99	0	0.053	0	0.053	0	0.105	0	0	0	0.053	0	0	0	0.053	0.053	0.105
44 - 44.99	0	0	0	0.143	0	0.071	0	0	0	0.071	0	0	0.071	0	0	0.143
45 - 45.99	0	0	0	0	0.136	0	0	0.045	0	0.045	0	0.045	0.045	0.045	0.045	0
46 - 46.99	0	0	0	0	0.059	0	0.059	0	0.059	0	0	0	0	0.059	0.059	0.059
47 - 47.99	0	0	0	0	0	0	0	0	0	0	0	0	0.095	0	0.048	0
48 - 48.99	0	0	0	0	0	0	0	0.05	0	0	0.05	0	0.05	0	0	0
49 - 49.99	0	0	0	0	0	0	0	0	0	0	0	0	0.111	0.111	0	0.111
50 - 50.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2
51 - 51.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
52 - 52.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53 - 53.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 2. (continued)

Interval	Age															
	37	38	39	40	41	43	44	45	46	47	48	49	51	52	54	56
7 - 7.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8 - 8.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16 - 16.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18 - 18.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19 - 19.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20 - 20.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22 - 22.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23 - 23.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29 - 29.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31 - 31.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32 - 32.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33 - 33.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34 - 34.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35 - 35.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36 - 36.99	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0
37 - 37.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38 - 38.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39 - 39.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40 - 40.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41 - 41.99	0	0.1	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0
42 - 42.99	0.133	0	0	0.067	0.067	0	0	0	0	0	0	0	0	0	0	0
43 - 43.99	0	0.053	0.16	0.053	0	0.053	0	0.053	0	0	0	0	0	0	0	0
44 - 44.99	0.143	0	0.07	0	0.071	0.071	0	0	0.071	0	0	0	0	0	0.071	0
45 - 45.99	0	0.091	0.14	0.182	0	0	0.045	0	0	0	0.045	0.045	0	0	0	0
46 - 46.99	0.059	0.059	0.06	0.118	0.059	0.059	0.059	0.118	0	0	0	0	0	0	0	0.059
47 - 47.99	0.095	0.143	0.05	0.19	0.048	0	0.095	0	0.048	0.095	0	0.048	0	0	0.048	0
48 - 48.99	0.05	0	0	0.3	0.05	0.1	0	0.15	0.05	0.05	0	0	0	0	0.05	0.05
49 - 49.99	0.111	0	0	0	0.111	0.111	0	0.111	0	0.111	0	0	0.111	0	0	0
50 - 50.99	0	0	0	0	0	0	0	0	0	0.4	0	0	0.2	0.2	0	0
51 - 51.99	0	0	0	0	0	0	0	0	0	0.333	0	0.667	0	0	0	0
52 - 52.99	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
53 - 53.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0