

The following supplement accompanies the article

## Changing maturation reaction norms and the effects of growth history in Alaskan Chinook salmon

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Supplementary tables and figures in order of text reference.

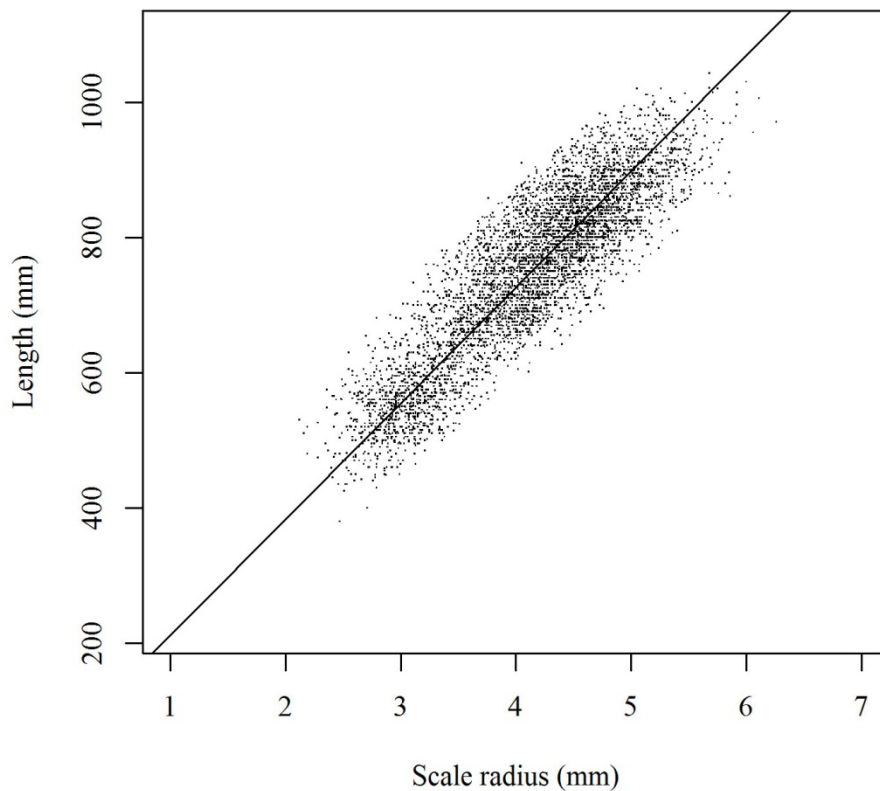


Figure S1. Scatterplot showing the relationship between mid-eye to fork length (*mm*) and scale radius (*mm*) from samples taken from the Kogrukluk River escapement weir (1981-2013) and the Andreafsky River escapement weir (1994-2012). Solid line is the ordinary least squares linear fit used in back-calculations with a biologically reasonable intercept set at 40 *mm* (mid-eye to fork length [*mm*] =  $171.6 \cdot \text{radius} + 40.0$ ).

Table S1. Numbers of measured scales utilized in analysis by brood year, sex, and age at maturity for the Andreafsky River Chinook salmon population. F. represents females and M. represents males. Superscript 'a' represents a stratum that was present in the population but from which there were no scales in good condition available to measure.

| Brood Year | M. 4 | M. 5 | M. 6 | M. Total | F. 5 | F. 6 | F. 7           | F. total | Total |
|------------|------|------|------|----------|------|------|----------------|----------|-------|
| 1988       | -    | -    | 25   | 25       | -    | 26   | 5              | 31       | 56    |
| 1989       | -    | 25   | 25   | 50       | 22   | 27   | 11             | 60       | 110   |
| 1990       | 14   | 19   | 11   | 44       | 3    | 25   | 0 <sup>a</sup> | 28       | 72    |
| 1991       | 26   | 25   | 23   | 74       | 19   | 26   | 4              | 49       | 123   |
| 1992       | 8    | 18   | 6    | 32       | 8    | 24   | 0 <sup>a</sup> | 32       | 64    |
| 1993       | 24   | 25   | 20   | 69       | 24   | 24   | 0              | 48       | 117   |
| 1994       | 24   | 20   | 10   | 54       | 13   | 25   | 2              | 40       | 94    |
| 1995       | 25   | 25   | 10   | 60       | 20   | 26   | 5              | 51       | 111   |
| 1996       | 8    | 8    | 19   | 35       | 2    | 23   | 5              | 30       | 65    |
| 1997       | 11   | 25   | 19   | 55       | 23   | 27   | 3              | 53       | 108   |
| 1998       | 25   | 24   | 10   | 59       | 21   | 24   | 1              | 46       | 105   |
| 1999       | 25   | 25   | 9    | 59       | 22   | 24   | 0 <sup>a</sup> | 46       | 105   |
| 2000       | 25   | 25   | 22   | 72       | 21   | 25   | 2              | 48       | 120   |
| 2001       | 13   | 25   | 12   | 50       | 24   | 20   | 6              | 50       | 100   |
| 2002       | 25   | 23   | 15   | 63       | 8    | 23   | 1              | 32       | 95    |
| 2003       | 23   | 25   | 25   | 73       | 18   | 22   | 3              | 43       | 116   |
| 2004       | 9    | 24   | 4    | 37       | 7    | 24   | 0 <sup>a</sup> | 31       | 68    |
| 2005       | 25   | 25   | 9    | 59       | 23   | 21   | 0 <sup>a</sup> | 44       | 103   |
| 2006       | 25   | 25   | 24   | 74       | 16   | 25   | -              | 41       | 115   |
| 2007       | 25   | 24   | -    | 49       | 20   | -    | -              | 20       | 69    |
| Total      | 360  | 435  | 298  | 1093     | 314  | 461  | 48             | 823      | 1916  |

Table S2. Numbers of measured scales utilized in analysis by brood year, sex and age at maturity for the Kogrukluk River Chinook salmon population. F. represents females and M. represents males. Superscript 'a' represents a stratum that was present in the population but from which there were no scales in good condition available to measure.

| Brood Year | M. 4           | M. 5 | M. 6 | M. Total | F. 5           | F. 6 | F. 7           | F total | Total |
|------------|----------------|------|------|----------|----------------|------|----------------|---------|-------|
| 1975       | -              | -    | 25   | 25       | -              | 25   | 15             | 40      | 65    |
| 1976       | -              | 25   | 13   | 38       | 13             | 24   | 10             | 47      | 85    |
| 1977       | 16             | 21   | 25   | 62       | 3              | 23   | 24             | 50      | 112   |
| 1978       | 15             | 25   | 25   | 65       | 0 <sup>a</sup> | 21   | 13             | 34      | 99    |
| 1979       | 25             | 25   | 23   | 73       | 11             | 27   | 12             | 50      | 123   |
| 1980       | 25             | 25   | 25   | 75       | 5              | 23   | 0              | 28      | 103   |
| 1981       | 25             | 25   | 23   | 73       | 5              | 24   | 26             | 55      | 128   |
| 1982       | 25             | 20   | 21   | 66       | 0              | 24   | 1              | 25      | 91    |
| 1983       | 19             | 24   | 24   | 67       | 24             | 24   | 4              | 52      | 119   |
| 1984       | 25             | 25   | 8    | 58       | 2              | 24   | 5              | 31      | 89    |
| 1985       | 17             | 25   | 25   | 67       | 19             | 25   | 4              | 48      | 115   |
| 1986       | 25             | 24   | 20   | 69       | 21             | 25   | 5              | 51      | 120   |
| 1987       | 11             | 25   | 9    | 45       | 11             | 23   | 2              | 36      | 81    |
| 1988       | 23             | 15   | 12   | 50       | 6              | 22   | 2              | 30      | 80    |
| 1989       | 24             | 23   | 25   | 72       | 19             | 23   | 20             | 62      | 134   |
| 1990       | 12             | 22   | 20   | 54       | 13             | 22   | 3              | 38      | 92    |
| 1991       | 18             | 25   | 23   | 66       | 22             | 23   | 1              | 46      | 112   |
| 1992       | 24             | 24   | 8    | 56       | 5              | 19   | 6              | 30      | 86    |
| 1993       | 17             | 23   | 25   | 65       | 11             | 24   | 1              | 36      | 101   |
| 1994       | 0 <sup>a</sup> | 24   | 5    | 29       | 10             | 23   | 3              | 36      | 65    |
| 1995       | 2              | 22   | 22   | 46       | 7              | 21   | 4              | 32      | 78    |
| 1996       | 5              | 23   | 23   | 51       | 8              | 23   | 11             | 42      | 93    |
| 1997       | 15             | 25   | 14   | 54       | 12             | 23   | 5              | 40      | 94    |
| 1998       | 25             | 24   | 24   | 73       | 10             | 20   | 5              | 35      | 108   |
| 1999       | 17             | 25   | 25   | 67       | 16             | 22   | 13             | 51      | 118   |
| 2000       | 24             | 25   | 17   | 66       | 21             | 25   | 8              | 54      | 120   |
| 2001       | 25             | 23   | 14   | 62       | 23             | 17   | 2              | 42      | 104   |
| 2002       | 19             | 25   | 4    | 48       | 12             | 21   | 2              | 35      | 83    |
| 2003       | 25             | 25   | 7    | 57       | 18             | 24   | 3              | 45      | 102   |
| 2004       | 25             | 21   | 12   | 58       | 16             | 24   | 0              | 40      | 98    |
| 2005       | 24             | 25   | 11   | 60       | 16             | 17   | 0 <sup>a</sup> | 33      | 93    |
| 2006       | 24             | 25   | 7    | 56       | 7              | 15   | 0              | 22      | 78    |
| 2007       | 26             | 17   | 3    | 46       | 11             | 13   | -              | 24      | 70    |
| 2008       | 0 <sup>a</sup> | 9    | -    | 9        | 5              | -    | -              | 5       | 14    |
| Total      | 611            | 759  | 567  | 1937     | 384            | 758  | 223            | 1365    | 3302  |

Table S3. Representation of back-calculation process for estimating distributions of immature and mature individuals by brood year at different ages.  $S$  represents the estimate of annual survival (1.0, 0.7. or 0.4) used in back-calculations. The shaded boxes represent the reconstructed numbers of fish that matured at each age that were in the ocean at ages 4-6 for brood year  $y-7$ . Reconstructed distributions of fish were subsequently used for estimating average growth by brood year and to weight PMRN maturation models using survey statistics.

| Return year | Brood year | Age at maturity | Year                      | y-4     | y-3     | y-2     | y-1     | y |
|-------------|------------|-----------------|---------------------------|---------|---------|---------|---------|---|
|             |            |                 | Back-calculation age      |         |         |         |         | 4 |
| y           | y-4        | 4               | Back-calculation equation |         |         |         |         | n |
|             |            |                 | Back-calculation age      |         |         |         | 4       | 5 |
| y           | y-5        | 5               | Back-calculation equation |         |         |         | $n/s^1$ | n |
|             |            |                 | Back-calculation age      |         |         | 4       | 5       | 6 |
| y           | y-6        | 6               | Back-calculation equation |         |         | $n/s^2$ | $n/s^1$ | n |
|             |            |                 | Back-calculation age      |         | 4       | 5       | 6       | 7 |
| y           | y-7        | 7               | Back-calculation equation |         | $n/s^3$ | $n/s^2$ | $n/s^1$ | n |
|             |            |                 | Back-calculation age      |         |         |         | 4       |   |
| y-1         | y-5        | 4               | Back-calculation equation |         |         |         | n       |   |
|             |            |                 | Back-calculation age      |         |         | 4       | 5       |   |
| y-1         | y-6        | 5               | Back-calculation equation |         |         | $n/s^1$ | n       |   |
|             |            |                 | Back-calculation age      |         | 4       | 5       | 6       |   |
| y-1         | y-7        | 6               | Back-calculation equation |         | $n/s^2$ | $n/s^1$ | n       |   |
|             |            |                 | Back-calculation age      | 4       | 5       | 6       | 7       |   |
| y-1         | y-8        | 7               | Back-calculation equation | $n/s^3$ | $n/s^2$ | $n/s^1$ | n       |   |
|             |            |                 | Back-calculation age      |         |         | 4       |         |   |
| y-2         | y-6        | 4               | Back-calculation equation |         |         | n       |         |   |
|             |            |                 | Back-calculation age      |         | 4       | 5       |         |   |
| y-2         | y-7        | 5               | Back-calculation equation |         | $n/s^1$ | n       |         |   |
|             |            |                 | Back-calculation age      | 4       | 5       | 6       |         |   |
| y-2         | y-8        | 6               | Back-calculation equation | $n/s^2$ | $n/s^1$ | n       |         |   |
|             |            |                 | Back-calculation age      | 5       | 6       | 7       |         |   |
| y-2         | y-9        | 7               | Back-calculation equation | $n/s^2$ | $n/s^1$ | n       |         |   |
|             |            |                 | Back-calculation age      |         | 4       |         |         |   |
| y-3         | y-7        | 4               | Back-calculation equation |         | n       |         |         |   |
|             |            |                 | Back-calculation age      | 4       | 5       |         |         |   |
| y-3         | y-8        | 5               | Back-calculation equation | $n/s^1$ | n       |         |         |   |
|             |            |                 | Back-calculation age      | 5       | 6       |         |         |   |
| y-3         | y-9        | 6               | Back-calculation equation | $n/s^1$ | n       |         |         |   |
|             |            |                 | Back-calculation age      | 6       | 7       |         |         |   |
| y-3         | y-10       | 7               | Back-calculation equation | $n/s^1$ | n       |         |         |   |

Table S4. Andreafsky River survey model weights for the annual survival ( $S$ ) = 1.0 scenario. F. represents females and M. represents males. Weights were used in logistic models estimating the probability of maturation with growth.

| Brood Year | M. 4                    | M. 5  | M. 6  | M. 5                    | M. 6  | F. 5  | F. 6                    | F. 7  | F. 6  | F. 7  |
|------------|-------------------------|-------|-------|-------------------------|-------|-------|-------------------------|-------|-------|-------|
|            | Age 4 maturity decision |       |       | Age 5 maturity decision |       |       | Age 6 maturity decision |       |       |       |
| 1988       | -                       | -     | -     | -                       | -     | -     | -                       | -     | 0.036 | 0.010 |
| 1989       | -                       | -     | -     | 0.034                   | 0.006 | 0.007 | 0.024                   | 0.018 | 0.028 | 0.021 |
| 1990       | 0.023                   | 0.023 | 0.022 | 0.034                   | 0.033 | 0.096 | 0.028                   | 0.001 | 0.040 | 0.002 |
| 1991       | 0.019                   | 0.016 | 0.004 | 0.032                   | 0.008 | 0.019 | 0.024                   | 0.008 | 0.037 | 0.012 |
| 1992       | 0.014                   | 0.029 | 0.059 | 0.033                   | 0.067 | 0.033 | 0.030                   | 0.011 | 0.040 | 0.015 |
| 1993       | 0.012                   | 0.022 | 0.008 | 0.031                   | 0.011 | 0.015 | 0.027                   | 0.000 | 0.042 | 0.000 |
| 1994       | 0.014                   | 0.026 | 0.014 | 0.040                   | 0.021 | 0.018 | 0.029                   | 0.020 | 0.038 | 0.025 |
| 1995       | 0.022                   | 0.014 | 0.011 | 0.030                   | 0.024 | 0.016 | 0.023                   | 0.017 | 0.034 | 0.025 |
| 1996       | 0.011                   | 0.071 | 0.018 | 0.078                   | 0.020 | 0.139 | 0.030                   | 0.008 | 0.041 | 0.011 |
| 1997       | 0.020                   | 0.027 | 0.006 | 0.034                   | 0.008 | 0.008 | 0.028                   | 0.014 | 0.035 | 0.018 |
| 1998       | 0.016                   | 0.021 | 0.010 | 0.035                   | 0.016 | 0.012 | 0.031                   | 0.001 | 0.042 | 0.001 |
| 1999       | 0.007                   | 0.031 | 0.006 | 0.037                   | 0.007 | 0.030 | 0.014                   | 0.000 | 0.042 | 0.001 |
| 2000       | 0.026                   | 0.008 | 0.006 | 0.024                   | 0.019 | 0.014 | 0.028                   | 0.000 | 0.040 | 0.001 |
| 2001       | 0.006                   | 0.031 | 0.012 | 0.034                   | 0.013 | 0.022 | 0.023                   | 0.003 | 0.048 | 0.005 |
| 2002       | 0.020                   | 0.017 | 0.007 | 0.035                   | 0.013 | 0.053 | 0.024                   | 0.007 | 0.042 | 0.012 |
| 2003       | 0.018                   | 0.018 | 0.005 | 0.031                   | 0.009 | 0.018 | 0.030                   | 0.004 | 0.045 | 0.006 |
| 2004       | 0.020                   | 0.032 | 0.010 | 0.040                   | 0.013 | 0.027 | 0.033                   | 0.013 | 0.040 | 0.016 |
| 2005       | 0.022                   | 0.014 | 0.012 | 0.031                   | 0.025 | 0.026 | 0.019                   | 0.002 | 0.047 | 0.005 |
| 2006       | 0.016                   | 0.021 | 0.004 | 0.034                   | 0.006 | -     | -                       | -     | -     | -     |
| 2007       | -                       | -     | -     | -                       | -     | -     | -                       | -     | -     | -     |
| Avg.       | 0.017                   | 0.025 | 0.013 | 0.036                   | 0.018 | 0.033 | 0.026                   | 0.007 | 0.040 | 0.010 |

Table S5. Andreafsky River survey model weights for the annual survival ( $S$ ) = 0.7 scenario. F. represents females and M. represents males. Weights were used in logistic models estimating the probability of maturation with growth.

| Brood Year | M. 4                    | M. 5  | M. 6  | M. 5                    | M. 6  | F. 5  | F. 6                    | F. 7  | F. 6  | F. 7  |
|------------|-------------------------|-------|-------|-------------------------|-------|-------|-------------------------|-------|-------|-------|
|            | Age 4 maturity decision |       |       | Age 5 maturity decision |       |       | Age 6 maturity decision |       |       |       |
| 1988       | -                       | -     | -     | -                       | -     | -     | -                       | -     | 0.036 | 0.014 |
| 1989       | -                       | -     | -     | 0.031                   | 0.009 | 0.005 | 0.023                   | 0.025 | 0.026 | 0.028 |
| 1990       | 0.016                   | 0.022 | 0.032 | 0.029                   | 0.041 | 0.074 | 0.031                   | 0.002 | 0.040 | 0.002 |
| 1991       | 0.015                   | 0.018 | 0.007 | 0.030                   | 0.011 | 0.014 | 0.026                   | 0.012 | 0.036 | 0.017 |
| 1992       | 0.009                   | 0.026 | 0.076 | 0.028                   | 0.082 | 0.025 | 0.032                   | 0.017 | 0.040 | 0.021 |
| 1993       | 0.008                   | 0.023 | 0.012 | 0.028                   | 0.015 | 0.012 | 0.030                   | 0.000 | 0.042 | 0.000 |
| 1994       | 0.011                   | 0.027 | 0.020 | 0.036                   | 0.027 | 0.013 | 0.031                   | 0.029 | 0.037 | 0.036 |
| 1995       | 0.017                   | 0.016 | 0.018 | 0.028                   | 0.031 | 0.012 | 0.024                   | 0.026 | 0.032 | 0.034 |
| 1996       | 0.007                   | 0.063 | 0.023 | 0.067                   | 0.024 | 0.104 | 0.032                   | 0.012 | 0.040 | 0.016 |
| 1997       | 0.014                   | 0.027 | 0.009 | 0.032                   | 0.010 | 0.006 | 0.030                   | 0.021 | 0.034 | 0.025 |
| 1998       | 0.012                   | 0.022 | 0.015 | 0.033                   | 0.022 | 0.009 | 0.033                   | 0.002 | 0.041 | 0.002 |
| 1999       | 0.005                   | 0.032 | 0.009 | 0.036                   | 0.010 | 0.026 | 0.018                   | 0.001 | 0.042 | 0.002 |
| 2000       | 0.021                   | 0.009 | 0.011 | 0.020                   | 0.023 | 0.011 | 0.031                   | 0.001 | 0.040 | 0.001 |
| 2001       | 0.004                   | 0.030 | 0.016 | 0.032                   | 0.017 | 0.018 | 0.027                   | 0.004 | 0.048 | 0.007 |
| 2002       | 0.016                   | 0.019 | 0.011 | 0.032                   | 0.018 | 0.043 | 0.028                   | 0.011 | 0.042 | 0.017 |
| 2003       | 0.014                   | 0.020 | 0.008 | 0.029                   | 0.011 | 0.014 | 0.033                   | 0.006 | 0.044 | 0.009 |
| 2004       | 0.015                   | 0.034 | 0.016 | 0.039                   | 0.018 | 0.020 | 0.034                   | 0.019 | 0.040 | 0.022 |
| 2005       | 0.017                   | 0.016 | 0.019 | 0.028                   | 0.033 | 0.022 | 0.023                   | 0.003 | 0.047 | 0.007 |
| 2006       | 0.012                   | 0.022 | 0.006 | 0.032                   | 0.008 | -     | -                       | -     | -     | -     |
| 2007       | -                       | -     | -     | -                       | -     | -     | -                       | -     | -     | -     |
| Avg.       | 0.013                   | 0.025 | 0.018 | 0.033                   | 0.023 | 0.025 | 0.029                   | 0.011 | 0.039 | 0.014 |

Table S6. Andreafsky River survey model weights for the annual survival ( $S$ ) = 0.4 scenario. F. represents females and M. represents males. Weights were used in logistic models estimating the probability of maturation with growth.

| Brood Year | M 4                     | M 5   | M 6   | M 5                     | M 6   | F 5   | F 6                     | F 7   | F 6   | F 7   |
|------------|-------------------------|-------|-------|-------------------------|-------|-------|-------------------------|-------|-------|-------|
|            | Age 4 maturity decision |       |       | Age 5 maturity decision |       |       | Age 7 maturity decision |       |       |       |
| 1988       | -                       | -     | -     | -                       | -     | -     | -                       | -     | 0.034 | 0.024 |
| 1989       | -                       | -     | -     | 0.027                   | 0.013 | 0.002 | 0.020                   | 0.037 | 0.021 | 0.039 |
| 1990       | 0.008                   | 0.019 | 0.047 | 0.022                   | 0.053 | 0.046 | 0.034                   | 0.003 | 0.040 | 0.004 |
| 1991       | 0.009                   | 0.019 | 0.013 | 0.025                   | 0.016 | 0.009 | 0.028                   | 0.024 | 0.034 | 0.029 |
| 1992       | 0.004                   | 0.020 | 0.101 | 0.021                   | 0.105 | 0.015 | 0.034                   | 0.032 | 0.039 | 0.036 |
| 1993       | 0.004                   | 0.021 | 0.019 | 0.023                   | 0.021 | 0.008 | 0.034                   | 0.000 | 0.042 | 0.000 |
| 1994       | 0.006                   | 0.026 | 0.034 | 0.030                   | 0.040 | 0.008 | 0.032                   | 0.053 | 0.035 | 0.059 |
| 1995       | 0.010                   | 0.017 | 0.033 | 0.022                   | 0.044 | 0.007 | 0.024                   | 0.045 | 0.028 | 0.053 |
| 1996       | 0.003                   | 0.049 | 0.031 | 0.050                   | 0.032 | 0.062 | 0.033                   | 0.022 | 0.038 | 0.026 |
| 1997       | 0.008                   | 0.026 | 0.015 | 0.028                   | 0.016 | 0.003 | 0.030                   | 0.038 | 0.032 | 0.041 |
| 1998       | 0.007                   | 0.023 | 0.027 | 0.028                   | 0.033 | 0.006 | 0.036                   | 0.003 | 0.041 | 0.004 |
| 1999       | 0.003                   | 0.032 | 0.015 | 0.034                   | 0.016 | 0.020 | 0.023                   | 0.002 | 0.041 | 0.003 |
| 2000       | 0.013                   | 0.010 | 0.020 | 0.015                   | 0.029 | 0.007 | 0.034                   | 0.001 | 0.040 | 0.001 |
| 2001       | 0.002                   | 0.027 | 0.026 | 0.027                   | 0.026 | 0.012 | 0.033                   | 0.009 | 0.046 | 0.012 |
| 2002       | 0.010                   | 0.020 | 0.020 | 0.027                   | 0.026 | 0.028 | 0.032                   | 0.023 | 0.041 | 0.029 |
| 2003       | 0.008                   | 0.019 | 0.013 | 0.024                   | 0.016 | 0.009 | 0.036                   | 0.013 | 0.043 | 0.015 |
| 2004       | 0.008                   | 0.034 | 0.027 | 0.037                   | 0.030 | 0.012 | 0.035                   | 0.034 | 0.039 | 0.037 |
| 2005       | 0.010                   | 0.017 | 0.035 | 0.023                   | 0.047 | 0.016 | 0.029                   | 0.008 | 0.046 | 0.012 |
| 2006       | 0.007                   | 0.023 | 0.010 | 0.028                   | 0.013 | -     | -                       | -     | -     | -     |
| 2007       | -                       | -     | -     | -                       | -     | -     | -                       | -     | -     | -     |
| Avg.       | 0.007                   | 0.024 | 0.029 | 0.027                   | 0.032 | 0.016 | 0.031                   | 0.020 | 0.038 | 0.024 |

Table S7. Kogrukluk River survey model weights for the annual survival ( $S$ ) = 1.0 scenario. F. represents females and M. represents males. Weights were used in logistic models estimating the probability of maturation with growth.

| Brood Year | M. 4                    | M. 5  | M. 6  | M. 5                    | M. 6  | F. 5  | F. 6                    | F. 7  | F. 6  | F. 7  |
|------------|-------------------------|-------|-------|-------------------------|-------|-------|-------------------------|-------|-------|-------|
|            | Age 4 maturity decision |       |       | Age 5 maturity decision |       |       | Age 6 maturity decision |       |       |       |
| 1975       | -                       | -     | -     | -                       | -     | -     | -                       | -     | 0.036 | 0.006 |
| 1976       | -                       | -     | -     | 0.023                   | 0.033 | 0.003 | 0.039                   | 0.001 | 0.041 | 0.001 |
| 1977       | 0.010                   | 0.035 | 0.004 | 0.042                   | 0.005 | 0.155 | 0.018                   | 0.005 | 0.033 | 0.010 |
| 1978       | 0.041                   | 0.006 | 0.009 | 0.017                   | 0.023 | 0.008 | 0.043                   | 0.006 | 0.044 | 0.006 |
| 1979       | 0.004                   | 0.027 | 0.010 | 0.030                   | 0.011 | 0.005 | 0.030                   | 0.011 | 0.032 | 0.011 |
| 1980       | 0.012                   | 0.021 | 0.007 | 0.030                   | 0.010 | 0.015 | 0.040                   | 0.000 | 0.043 | 0.000 |
| 1981       | 0.009                   | 0.023 | 0.009 | 0.029                   | 0.012 | 0.011 | 0.023                   | 0.015 | 0.025 | 0.016 |
| 1982       | 0.006                   | 0.019 | 0.023 | 0.022                   | 0.027 | 0.006 | 0.038                   | 0.043 | 0.038 | 0.043 |
| 1983       | 0.006                   | 0.021 | 0.017 | 0.023                   | 0.019 | 0.006 | 0.033                   | 0.018 | 0.038 | 0.021 |
| 1984       | 0.009                   | 0.026 | 0.016 | 0.033                   | 0.021 | 0.051 | 0.036                   | 0.007 | 0.040 | 0.008 |
| 1985       | 0.016                   | 0.023 | 0.006 | 0.032                   | 0.008 | 0.018 | 0.025                   | 0.004 | 0.039 | 0.006 |
| 1986       | 0.021                   | 0.015 | 0.006 | 0.032                   | 0.012 | 0.010 | 0.027                   | 0.026 | 0.033 | 0.033 |
| 1987       | 0.015                   | 0.021 | 0.034 | 0.025                   | 0.041 | 0.007 | 0.038                   | 0.027 | 0.041 | 0.029 |
| 1988       | 0.009                   | 0.033 | 0.025 | 0.041                   | 0.032 | 0.016 | 0.039                   | 0.028 | 0.043 | 0.031 |
| 1989       | 0.010                   | 0.021 | 0.011 | 0.027                   | 0.015 | 0.010 | 0.032                   | 0.003 | 0.040 | 0.004 |
| 1990       | 0.016                   | 0.025 | 0.013 | 0.031                   | 0.016 | 0.033 | 0.024                   | 0.016 | 0.042 | 0.028 |
| 1991       | 0.016                   | 0.022 | 0.007 | 0.031                   | 0.010 | 0.007 | 0.035                   | 0.015 | 0.042 | 0.018 |
| 1992       | 0.012                   | 0.022 | 0.023 | 0.031                   | 0.033 | 0.022 | 0.043                   | 0.010 | 0.049 | 0.012 |
| 1993       | 0.029                   | 0.016 | 0.006 | 0.031                   | 0.012 | 0.028 | 0.028                   | 0.011 | 0.040 | 0.015 |
| 1994       | 0.143                   | 0.025 | 0.022 | 0.035                   | 0.031 | 0.017 | 0.035                   | 0.013 | 0.042 | 0.015 |
| 1995       | 0.049                   | 0.022 | 0.019 | 0.025                   | 0.021 | 0.020 | 0.039                   | 0.012 | 0.045 | 0.014 |
| 1996       | 0.015                   | 0.027 | 0.013 | 0.029                   | 0.014 | 0.009 | 0.034                   | 0.012 | 0.037 | 0.013 |
| 1997       | 0.009                   | 0.027 | 0.014 | 0.031                   | 0.016 | 0.009 | 0.037                   | 0.009 | 0.041 | 0.010 |
| 1998       | 0.007                   | 0.026 | 0.008 | 0.032                   | 0.010 | 0.009 | 0.044                   | 0.007 | 0.048 | 0.007 |
| 1999       | 0.010                   | 0.026 | 0.008 | 0.031                   | 0.009 | 0.006 | 0.036                   | 0.009 | 0.039 | 0.010 |
| 2000       | 0.019                   | 0.017 | 0.007 | 0.032                   | 0.012 | 0.017 | 0.024                   | 0.006 | 0.037 | 0.009 |
| 2001       | 0.014                   | 0.019 | 0.015 | 0.029                   | 0.024 | 0.013 | 0.041                   | 0.006 | 0.058 | 0.009 |
| 2002       | 0.028                   | 0.017 | 0.015 | 0.035                   | 0.033 | 0.028 | 0.029                   | 0.027 | 0.044 | 0.041 |
| 2003       | 0.015                   | 0.021 | 0.013 | 0.034                   | 0.021 | 0.017 | 0.028                   | 0.011 | 0.040 | 0.016 |
| 2004       | 0.015                   | 0.026 | 0.007 | 0.041                   | 0.011 | 0.017 | 0.030                   | 0.000 | 0.042 | 0.000 |
| 2005       | 0.015                   | 0.022 | 0.010 | 0.033                   | 0.015 | 0.020 | 0.038                   | 0.021 | 0.055 | 0.032 |
| 2006       | 0.015                   | 0.018 | 0.027 | 0.028                   | 0.042 | 0.033 | 0.051                   | 0.000 | 0.067 | 0.000 |
| 2007       | 0.012                   | 0.040 | 0.005 | 0.058                   | 0.007 | -     | -                       | -     | -     | -     |
| Avg.       | 0.032                   | 0.023 | 0.014 | 0.034                   | 0.019 | 0.027 | 0.034                   | 0.012 | 0.043 | 0.015 |



Table S8. Kogrukluk River survey model weights for the annual survival ( $S$ ) = 0.7 scenario. F. represents females and M. represents males. Weights were used in logistic models estimating the probability of maturation with growth.

| Brood Year | M. 4                    | M. 5  | M. 6  | M. 5                    | M. 6  | F. 5  | F. 6                    | F. 7  | F. 6  | F. 7  |
|------------|-------------------------|-------|-------|-------------------------|-------|-------|-------------------------|-------|-------|-------|
|            | Age 4 maturity decision |       |       | Age 5 maturity decision |       |       | Age 6 maturity decision |       |       |       |
| 1975       | -                       | -     | -     | -                       | -     | -     | -                       | -     | 0.035 | 0.009 |
| 1976       | -                       | -     | -     | 0.019                   | 0.040 | 0.002 | 0.040                   | 0.001 | 0.041 | 0.001 |
| 1977       | 0.007                   | 0.036 | 0.006 | 0.040                   | 0.006 | 0.118 | 0.019                   | 0.008 | 0.030 | 0.013 |
| 1978       | 0.032                   | 0.007 | 0.014 | 0.013                   | 0.027 | 0.006 | 0.042                   | 0.009 | 0.042 | 0.009 |
| 1979       | 0.003                   | 0.025 | 0.014 | 0.027                   | 0.015 | 0.004 | 0.029                   | 0.015 | 0.030 | 0.015 |
| 1980       | 0.008                   | 0.021 | 0.010 | 0.027                   | 0.013 | 0.011 | 0.041                   | 0.000 | 0.043 | 0.000 |
| 1981       | 0.006                   | 0.022 | 0.013 | 0.026                   | 0.015 | 0.006 | 0.020                   | 0.019 | 0.021 | 0.019 |
| 1982       | 0.004                   | 0.016 | 0.028 | 0.018                   | 0.031 | 0.004 | 0.036                   | 0.059 | 0.037 | 0.060 |
| 1983       | 0.004                   | 0.018 | 0.021 | 0.019                   | 0.022 | 0.004 | 0.033                   | 0.026 | 0.037 | 0.030 |
| 1984       | 0.006                   | 0.026 | 0.023 | 0.031                   | 0.027 | 0.036 | 0.037                   | 0.010 | 0.039 | 0.011 |
| 1985       | 0.011                   | 0.024 | 0.008 | 0.030                   | 0.010 | 0.014 | 0.028                   | 0.007 | 0.039 | 0.009 |
| 1986       | 0.017                   | 0.017 | 0.009 | 0.029                   | 0.016 | 0.007 | 0.027                   | 0.037 | 0.031 | 0.043 |
| 1987       | 0.009                   | 0.020 | 0.045 | 0.022                   | 0.050 | 0.005 | 0.038                   | 0.038 | 0.040 | 0.040 |
| 1988       | 0.006                   | 0.031 | 0.034 | 0.035                   | 0.039 | 0.011 | 0.039                   | 0.040 | 0.042 | 0.043 |
| 1989       | 0.007                   | 0.020 | 0.015 | 0.024                   | 0.018 | 0.007 | 0.033                   | 0.005 | 0.039 | 0.005 |
| 1990       | 0.011                   | 0.024 | 0.017 | 0.028                   | 0.020 | 0.026 | 0.027                   | 0.025 | 0.040 | 0.038 |
| 1991       | 0.011                   | 0.023 | 0.010 | 0.028                   | 0.013 | 0.005 | 0.036                   | 0.023 | 0.041 | 0.026 |
| 1992       | 0.008                   | 0.022 | 0.034 | 0.028                   | 0.042 | 0.016 | 0.044                   | 0.015 | 0.048 | 0.016 |
| 1993       | 0.022                   | 0.017 | 0.009 | 0.027                   | 0.015 | 0.022 | 0.030                   | 0.017 | 0.040 | 0.022 |
| 1994       | 0.104                   | 0.026 | 0.033 | 0.033                   | 0.042 | 0.012 | 0.036                   | 0.019 | 0.041 | 0.021 |
| 1995       | 0.030                   | 0.020 | 0.023 | 0.021                   | 0.025 | 0.014 | 0.039                   | 0.018 | 0.044 | 0.020 |
| 1996       | 0.010                   | 0.024 | 0.017 | 0.025                   | 0.018 | 0.006 | 0.033                   | 0.017 | 0.035 | 0.018 |
| 1997       | 0.006                   | 0.026 | 0.019 | 0.029                   | 0.020 | 0.006 | 0.037                   | 0.013 | 0.040 | 0.014 |
| 1998       | 0.005                   | 0.025 | 0.011 | 0.029                   | 0.012 | 0.006 | 0.044                   | 0.010 | 0.047 | 0.010 |
| 1999       | 0.007                   | 0.025 | 0.010 | 0.028                   | 0.012 | 0.004 | 0.035                   | 0.013 | 0.037 | 0.014 |
| 2000       | 0.014                   | 0.019 | 0.010 | 0.029                   | 0.016 | 0.013 | 0.026                   | 0.009 | 0.036 | 0.013 |
| 2001       | 0.010                   | 0.019 | 0.022 | 0.025                   | 0.030 | 0.010 | 0.044                   | 0.009 | 0.057 | 0.012 |
| 2002       | 0.022                   | 0.019 | 0.025 | 0.033                   | 0.044 | 0.021 | 0.032                   | 0.042 | 0.042 | 0.056 |
| 2003       | 0.011                   | 0.023 | 0.020 | 0.032                   | 0.028 | 0.013 | 0.030                   | 0.018 | 0.039 | 0.023 |
| 2004       | 0.011                   | 0.028 | 0.011 | 0.039                   | 0.015 | 0.013 | 0.033                   | 0.000 | 0.042 | 0.000 |
| 2005       | 0.011                   | 0.023 | 0.015 | 0.031                   | 0.020 | 0.015 | 0.041                   | 0.033 | 0.054 | 0.044 |
| 2006       | 0.011                   | 0.019 | 0.040 | 0.025                   | 0.053 | 0.025 | 0.055                   | 0.000 | 0.067 | 0.000 |
| 2007       | 0.009                   | 0.044 | 0.008 | 0.057                   | 0.011 | -     | -                       | -     | -     | -     |
| Avg.       | 0.014                   | 0.023 | 0.019 | 0.028                   | 0.024 | 0.015 | 0.035                   | 0.018 | 0.040 | 0.020 |

Table S9. Kogrukluk River survey model weights for the annual survival ( $S$ ) = 0.4 scenario. F. represents females and M. represents males. Weights were used in logistic models estimating the probability of maturation with growth.

| Brood Year | M. 4                    | M. 5  | M. 6  | M. 5                    | M. 6  | F. 5  | F. 6  | F. 7  | F. 6                    | F. 7  |
|------------|-------------------------|-------|-------|-------------------------|-------|-------|-------|-------|-------------------------|-------|
|            | Age 6 maturity decision |       |       | Age 5 maturity decision |       |       |       |       | Age 6 maturity decision |       |
| 1975       | -                       | -     | -     | -                       | -     | -     | -     | -     | 0.032                   | 0.014 |
| 1976       | -                       | -     | -     | 0.014                   | 0.051 | 0.001 | 0.040 | 0.002 | 0.041                   | 0.002 |
| 1977       | 0.004                   | 0.034 | 0.009 | 0.036                   | 0.010 | 0.068 | 0.019 | 0.015 | 0.024                   | 0.018 |
| 1978       | 0.017                   | 0.007 | 0.023 | 0.009                   | 0.031 | 0.003 | 0.039 | 0.014 | 0.039                   | 0.014 |
| 1979       | 0.001                   | 0.021 | 0.020 | 0.021                   | 0.020 | 0.002 | 0.026 | 0.023 | 0.026                   | 0.024 |
| 1980       | 0.004                   | 0.019 | 0.016 | 0.022                   | 0.018 | 0.006 | 0.042 | 0.000 | 0.043                   | 0.000 |
| 1981       | 0.003                   | 0.019 | 0.020 | 0.021                   | 0.021 | 0.003 | 0.015 | 0.024 | 0.015                   | 0.024 |
| 1982       | 0.001                   | 0.012 | 0.035 | 0.012                   | 0.036 | 0.002 | 0.034 | 0.096 | 0.034                   | 0.096 |
| 1983       | 0.001                   | 0.013 | 0.027 | 0.014                   | 0.028 | 0.002 | 0.032 | 0.045 | 0.034                   | 0.047 |
| 1984       | 0.003                   | 0.025 | 0.038 | 0.027                   | 0.041 | 0.020 | 0.036 | 0.017 | 0.038                   | 0.018 |
| 1985       | 0.006                   | 0.022 | 0.014 | 0.025                   | 0.015 | 0.009 | 0.031 | 0.013 | 0.038                   | 0.015 |
| 1986       | 0.010                   | 0.017 | 0.017 | 0.023                   | 0.022 | 0.004 | 0.025 | 0.061 | 0.027                   | 0.065 |
| 1987       | 0.004                   | 0.016 | 0.063 | 0.016                   | 0.066 | 0.003 | 0.037 | 0.064 | 0.038                   | 0.066 |
| 1988       | 0.003                   | 0.025 | 0.048 | 0.026                   | 0.051 | 0.006 | 0.038 | 0.068 | 0.039                   | 0.071 |
| 1989       | 0.003                   | 0.016 | 0.022 | 0.018                   | 0.024 | 0.004 | 0.033 | 0.008 | 0.036                   | 0.009 |
| 1990       | 0.005                   | 0.020 | 0.025 | 0.021                   | 0.026 | 0.016 | 0.029 | 0.049 | 0.037                   | 0.061 |
| 1991       | 0.006                   | 0.021 | 0.017 | 0.023                   | 0.018 | 0.003 | 0.037 | 0.040 | 0.040                   | 0.043 |
| 1992       | 0.004                   | 0.020 | 0.053 | 0.022                   | 0.059 | 0.009 | 0.042 | 0.025 | 0.044                   | 0.026 |
| 1993       | 0.012                   | 0.017 | 0.016 | 0.021                   | 0.020 | 0.013 | 0.033 | 0.031 | 0.039                   | 0.037 |
| 1994       | 0.058                   | 0.025 | 0.056 | 0.029                   | 0.063 | 0.007 | 0.036 | 0.033 | 0.039                   | 0.035 |
| 1995       | 0.013                   | 0.014 | 0.030 | 0.015                   | 0.031 | 0.008 | 0.039 | 0.031 | 0.041                   | 0.033 |
| 1996       | 0.004                   | 0.019 | 0.024 | 0.019                   | 0.024 | 0.003 | 0.030 | 0.027 | 0.030                   | 0.027 |
| 1997       | 0.003                   | 0.022 | 0.028 | 0.024                   | 0.029 | 0.004 | 0.037 | 0.022 | 0.038                   | 0.023 |
| 1998       | 0.003                   | 0.022 | 0.017 | 0.024                   | 0.018 | 0.004 | 0.044 | 0.017 | 0.046                   | 0.018 |
| 1999       | 0.003                   | 0.022 | 0.016 | 0.023                   | 0.017 | 0.002 | 0.032 | 0.021 | 0.033                   | 0.022 |
| 2000       | 0.008                   | 0.019 | 0.019 | 0.024                   | 0.023 | 0.008 | 0.028 | 0.017 | 0.033                   | 0.020 |
| 2001       | 0.005                   | 0.017 | 0.035 | 0.019                   | 0.040 | 0.006 | 0.048 | 0.018 | 0.056                   | 0.021 |
| 2002       | 0.014                   | 0.021 | 0.050 | 0.029                   | 0.068 | 0.013 | 0.033 | 0.077 | 0.039                   | 0.091 |
| 2003       | 0.007                   | 0.023 | 0.035 | 0.028                   | 0.042 | 0.008 | 0.032 | 0.033 | 0.037                   | 0.038 |
| 2004       | 0.006                   | 0.029 | 0.020 | 0.034                   | 0.024 | 0.008 | 0.036 | 0.000 | 0.042                   | 0.000 |
| 2005       | 0.006                   | 0.023 | 0.026 | 0.027                   | 0.030 | 0.009 | 0.043 | 0.062 | 0.050                   | 0.072 |
| 2006       | 0.006                   | 0.017 | 0.063 | 0.020                   | 0.073 | 0.015 | 0.060 | 0.000 | 0.067                   | 0.000 |
| 2007       | 0.006                   | 0.048 | 0.015 | 0.056                   | 0.018 | -     | -     | -     | -                       | -     |
| Avg.       | 0.007                   | 0.021 | 0.029 | 0.000                   | 0.033 | 0.009 | 0.035 | 0.031 | 0.038                   | 0.033 |

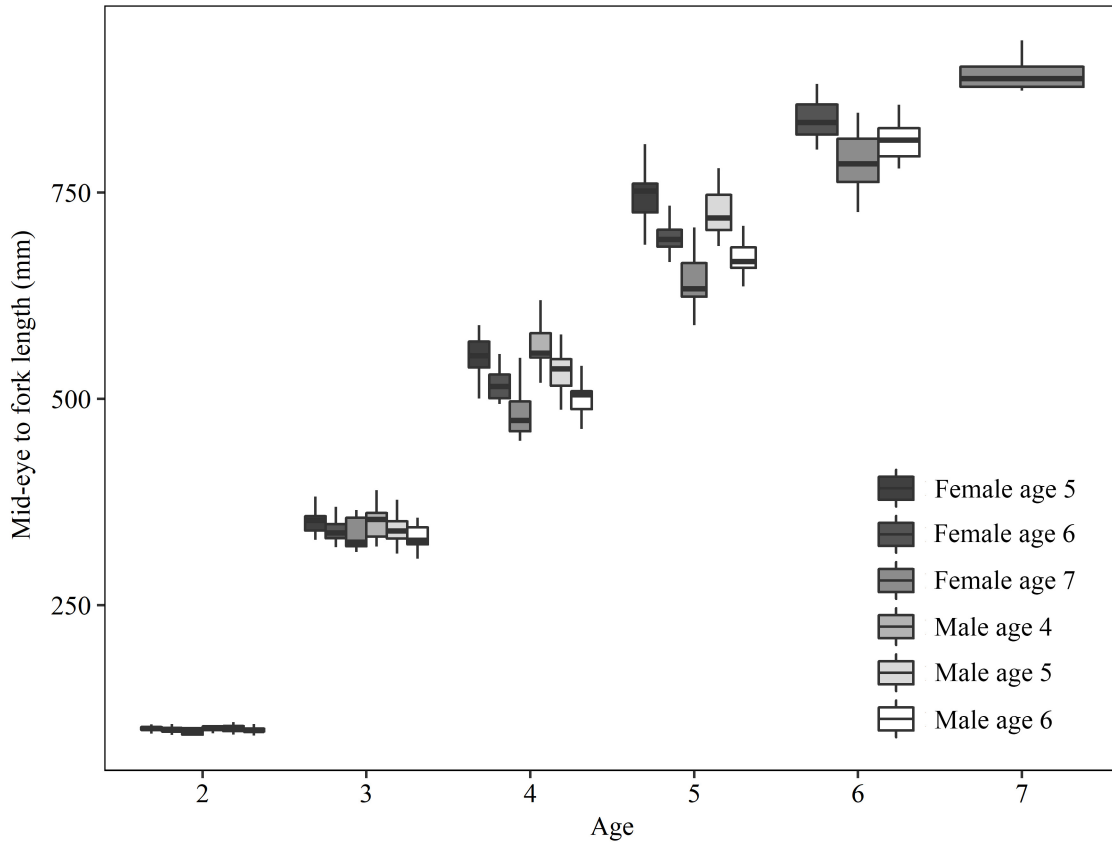


Figure S2. Boxplots of average back-calculated size-at-age estimates (mid-eye to fork lengths) by sex/age at maturity combinations for all brood years (1990-2005) in the Andreafsky River. Back-calculations were informed by retrospective scale analysis. Relationship between scale radius and fork length used for back-calculations was estimated using ordinary least squares linear regression with a fixed intercept (mid-eye to fork length  $[mm] = 171.6 * radius + 40.0$ ).