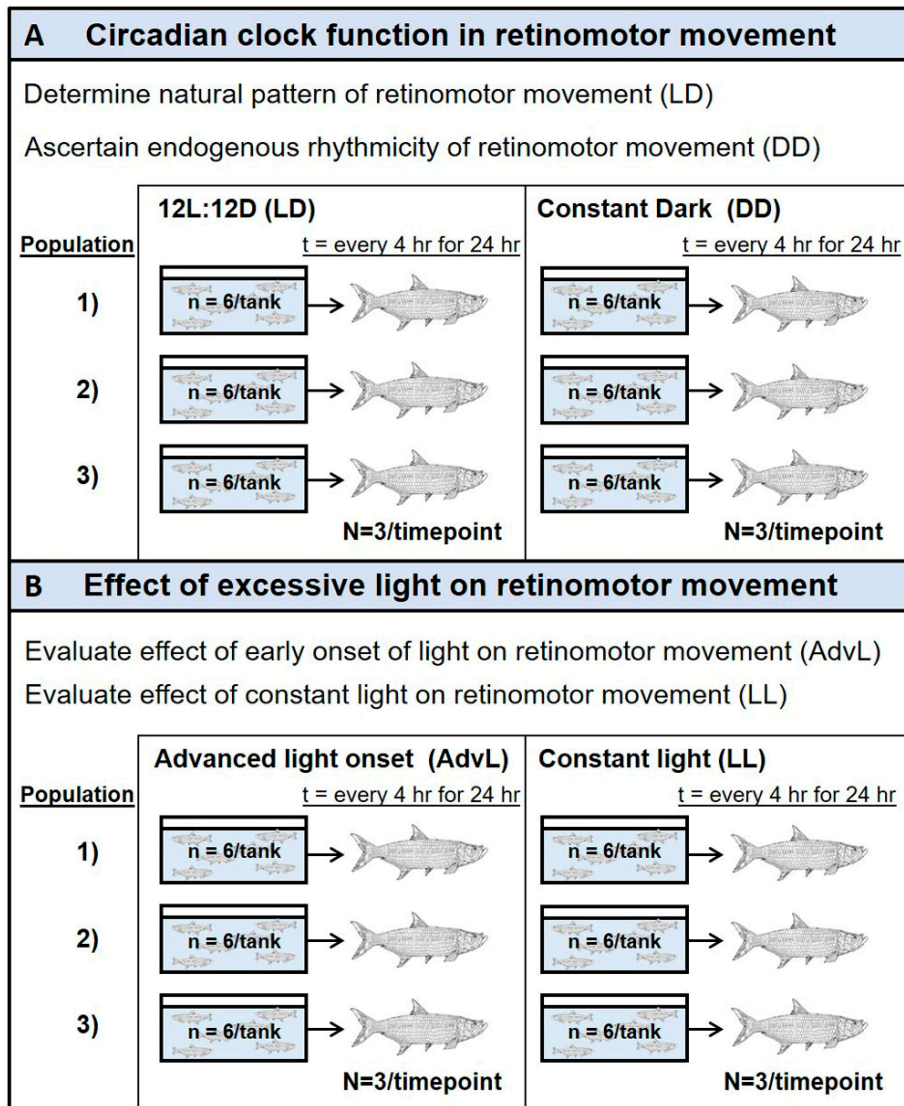




**Figure S1.** Objectives and flow chart for experiments investigating retinomotor movement in juvenile *Megalops atlanticus*. Four lighting “treatments” were designed to determine how oscillations of retinomotor movement changed over the course of the day (LD), and whether these changes continued in constant darkness (DD). Effects of unnatural light exposure were examined in fish exposed to an advanced onset of light exposure (AdvL; 4 hr advance) and constant light (LL). Three replicates were tested per lighting treatment.

**Table S1.** Sample data set of rod and cone myoid lengths ( $\mu\text{m}$ ) for a single specimen used in studies of retinomotor movement. Distances of outer segments from the outer limiting membrane were obtained from thirty rods and cones per specimen.

| Dark-Adapted Rods |                          | Dark-Adapted Cones |                          |
|-------------------|--------------------------|--------------------|--------------------------|
| Item              | Length ( $\mu\text{m}$ ) | Item               | Length ( $\mu\text{m}$ ) |
| 1                 | 33.86                    | 1                  | 45.04                    |
| 2                 | 40.85                    | 2                  | 45.2                     |
| 3                 | 41.71                    | 3                  | 46.69                    |
| 4                 | 44.39                    | 4                  | 49.59                    |
| 5                 | 46.59                    | 5                  | 51.2                     |
| 6                 | 49.05                    | 6                  | 52.02                    |
| 7                 | 49.81                    | 7                  | 52.95                    |
| 8                 | 50.13                    | 8                  | 57.75                    |
| 9                 | 50.76                    | 9                  | 59.31                    |
| 10                | 51.38                    | 10                 | 59.83                    |
| 11                | 51.39                    | 11                 | 61.99                    |
| 12                | 51.5                     | 12                 | 62.23                    |
| 13                | 52.03                    | 13                 | 62.49                    |
| 14                | 53.26                    | 14                 | 62.5                     |
| 15                | 53.42                    | 15                 | 63.78                    |
| 16                | 53.82                    | 16                 | 63.79                    |
| 17                | 54.66                    | 17                 | 67.32                    |
| 18                | 55.03                    | 18                 | 67.66                    |
| 19                | 55.38                    | 19                 | 67.95                    |
| 20                | 55.78                    | 20                 | 70.18                    |
| 21                | 57.88                    | 21                 | 70.57                    |
| 22                | 58.46                    | 22                 | 71.61                    |
| 23                | 60                       | 23                 | 72.98                    |
| 24                | 61.06                    | 24                 | 74.5                     |
| 25                | 63.15                    | 25                 | 76.64                    |
| 26                | 63.6                     | 26                 | 78.11                    |
| 27                | 63.8                     | 27                 | 80.18                    |
| 28                | 64.73                    | 28                 | 83.52                    |
| 29                | 71.26                    | 29                 | 111.84                   |
| 30                | 88.47                    | 30                 | 117.63                   |
| <b>Mean</b>       | <b>54.91</b>             | <b>Mean</b>        | <b>66.9</b>              |
| St.Dev            | 9.91                     | St.Dev             | 16.35                    |

**Table S2.** Summary of Tukey post-hoc test on rod myoid length ( $\mu\text{m}$ ) across time points in juvenile tarpon in LD. Box shading of Time point (i) indicates lighting condition at time of testing (white=light; black=dark). Statistically significant  $p$ -values ( $\alpha \leq 0.05$ ) are in bold.

|                |                | Mean Difference | Standard Error | p-Value |
|----------------|----------------|-----------------|----------------|---------|
| (i) Time point | (j) Time point | (i-j)           |                |         |
| 08:00          | 12:00          | -2.49           | 3.03           | .958    |
|                | 16:00          | -3.36           | 3.03           | .869    |
|                | 20:00          | 29.18           | 3.03           | .000    |
|                | 00:00          | 32.23           | 3.03           | .000    |
|                | 04:00          | 28.49           | 3.03           | .000    |
| 12:00          | 08:00          | 2.49            | 3.03           | .958    |
|                | 16:00          | -.87            | 3.03           | 1.000   |
|                | 20:00          | 31.66           | 3.03           | .000    |
|                | 00:00          | 34.72           | 3.03           | .000    |
|                | 04:00          | 30.98           | 3.03           | .000    |
| 16:00          | 08:00          | 3.36            | 3.03           | .869    |
|                | 12:00          | .87             | 3.03           | 1.000   |
|                | 20:00          | 32.53           | 3.03           | .000    |
|                | 00:00          | 35.59           | 3.03           | .000    |
|                | 04:00          | 31.85           | 3.03           | .000    |
| 20:00          | 08:00          | -29.18          | 3.03           | .000    |
|                | 12:00          | -31.66          | 3.03           | .000    |
|                | 16:00          | -32.53          | 3.03           | .000    |
|                | 00:00          | 3.05            | 3.03           | .907    |
|                | 04:00          | -.69            | 3.03           | 1.000   |
| 00:00          | 08:00          | -32.23          | 3.03           | .000    |
|                | 12:00          | -34.72          | 3.03           | .000    |
|                | 16:00          | -35.59          | 3.03           | .000    |
|                | 20:00          | -3.05           | 3.03           | .907    |
|                | 04:00          | -3.74           | 3.03           | .812    |
| 04:00          | 08:00          | -28.49          | 3.03           | .000    |
|                | 12:00          | -30.98          | 3.03           | .000    |
|                | 16:00          | -31.85          | 3.03           | .000    |
|                | 20:00          | .69             | 3.03           | 1.000   |
|                | 00:00          | 3.74            | 3.03           | .812    |

**Table S3.** Summary of Tukey post-hoc test on cone myoid length ( $\mu\text{m}$ ) across time points in juvenile tarpon in LD. Box shading of Time point (i) indicates lighting condition at time of testing (white=light; black=dark). Statistically significant  $p$ -values ( $\alpha \leq 0.05$ ) are in bold.

|                |                | Mean Difference | Standard Error | $p$ -Value  |
|----------------|----------------|-----------------|----------------|-------------|
| (i) Time point | (j) Time point | (i-j)           |                |             |
| 08:00          | 12:00          | .98             | 7.13           | 1.000       |
|                | 16:00          | 1.08            | 7.13           | 1.000       |
|                | 20:00          | -33.96          | 7.13           | <b>.005</b> |
|                | 00:00          | -62.83          | 7.13           | <b>.000</b> |
|                | 04:00          | -64.89          | 7.13           | <b>.000</b> |
| 12:00          | 08:00          | -.98            | 7.13           | 1.000       |
|                | 16:00          | .10             | 7.13           | 1.000       |
|                | 20:00          | -34.93          | 7.13           | <b>.004</b> |
|                | 00:00          | -63.80          | 7.13           | <b>.000</b> |
|                | 04:00          | -65.87          | 7.13           | <b>.000</b> |
| 16:00          | 08:00          | -1.08           | 7.13           | 1.000       |
|                | 12:00          | -.10            | 7.13           | 1.000       |
|                | 20:00          | -35.03          | 7.13           | <b>.004</b> |
|                | 00:00          | -63.90          | 7.13           | <b>.000</b> |
|                | 04:00          | -65.97          | 7.13           | <b>.000</b> |
| 20:00          | 08:00          | 33.96           | 7.13           | <b>.005</b> |
|                | 12:00          | 34.93           | 7.13           | <b>.004</b> |
|                | 16:00          | 35.03           | 7.13           | <b>.004</b> |
|                | 00:00          | -28.87          | 7.13           | <b>.016</b> |
|                | 04:00          | -30.93          | 7.13           | <b>.010</b> |
| 00:00          | 08:00          | 62.83           | 7.13           | <b>.000</b> |
|                | 12:00          | 63.80           | 7.13           | <b>.000</b> |
|                | 16:00          | 63.90           | 7.13           | <b>.000</b> |
|                | 20:00          | 28.87           | 7.13           | <b>.016</b> |
|                | 04:00          | -2.06           | 7.13           | 1.000       |
| 04:00          | 08:00          | 64.89           | 7.13           | <b>.000</b> |
|                | 12:00          | 65.87           | 7.13           | <b>.000</b> |
|                | 16:00          | 65.97           | 7.13           | <b>.000</b> |
|                | 20:00          | 30.93           | 7.13           | <b>.010</b> |
|                | 00:00          | 2.06            | 7.13           | 1.000       |

**Table S4.** Summary of Games-Howell post-hoc test on cone myoid length ( $\mu\text{m}$ ) across time points in juvenile tarpon in DD. Box shading of Time point (i) indicates subjective lighting condition at time of testing (light grey=subjective day; dark grey=subjective night). Statistically significant  $p$ -values ( $\alpha \leq 0.05$ ) are in bold.

| (i) Time point | (j) Time point | Mean Difference | Standard Error | $p$ -Value  |
|----------------|----------------|-----------------|----------------|-------------|
|                |                | (i-j)           |                |             |
| 08:00          | 12:00          | 3.36            | 7.08           | .993        |
|                | 16:00          | -11.12          | 15.36          | .965        |
|                | 20:00          | -32.15          | 8.36           | .113        |
|                | 00:00          | -25.86          | 7.95           | .190        |
|                | 04:00          | -17.91          | 6.97           | .378        |
| 12:00          | 08:00          | -3.36           | 7.08           | .993        |
|                | 16:00          | -14.49          | 13.81          | .871        |
|                | 20:00          | -35.51          | 4.97           | <b>.044</b> |
|                | 00:00          | -29.23          | 4.25           | <b>.041</b> |
|                | 04:00          | -21.28          | 1.86           | <b>.004</b> |
| 16:00          | 08:00          | 11.12           | 15.36          | .965        |
|                | 12:00          | 14.49           | 13.81          | .871        |
|                | 20:00          | -21.02          | 14.51          | .716        |
|                | 00:00          | -14.74          | 14.28          | .878        |
|                | 04:00          | -6.79           | 13.76          | .991        |
| 20:00          | 08:00          | 32.15           | 8.36           | .113        |
|                | 12:00          | 35.51           | 4.97           | <b>.044</b> |
|                | 16:00          | 21.02           | 14.51          | .716        |
|                | 00:00          | 6.28            | 6.15           | .889        |
|                | 04:00          | 14.23           | 4.82           | .299        |
| 00:00          | 08:00          | 25.86           | 7.95           | .190        |
|                | 12:00          | 29.23           | 4.25           | <b>.041</b> |
|                | 16:00          | 14.74           | 14.28          | .878        |
|                | 20:00          | -6.28           | 6.15           | .889        |
|                | 04:00          | 7.95            | 4.07           | .534        |
| 04:00          | 08:00          | 17.91           | 6.97           | .378        |
|                | 12:00          | 21.28           | 1.86           | <b>.004</b> |
|                | 16:00          | 6.79            | 13.76          | .991        |
|                | 20:00          | -14.23          | 4.82           | .299        |
|                | 00:00          | -7.95           | 4.07           | .534        |

**Table S5.** Summary of Kruskal-Wallis post-hoc pairwise test on rod myoid length ( $\mu\text{m}$ ) across time points in juvenile tarpon in AdvL. Box shading of Time point (i) indicates lighting condition at time of testing (white=light; black=dark). Statistically significant  $p$ -values ( $\alpha \leq 0.05$ ) are in bold.

| Time point | Time point | Test Statistic | Standard Error | $p$ -Value  |
|------------|------------|----------------|----------------|-------------|
| 08:00      | 12:00      | -.67           | 4.36           | .878        |
|            | 16:00      | 11.33          | 4.36           | <b>.009</b> |
|            | 20:00      | 6.00           | 4.36           | .169        |
|            | 00:00      | 7.67           | 4.36           | .079        |
|            | 04:00      | -1.33          | 4.36           | .760        |
| 12:00      | 08:00      | -.67           | 4.36           | .878        |
|            | 16:00      | 12.00          | 4.36           | <b>.006</b> |
|            | 20:00      | 6.67           | 4.36           | .126        |
|            | 00:00      | 8.33           | 4.36           | .056        |
|            | 04:00      | -.67           | 4.36           | .878        |
| 16:00      | 08:00      | 11.33          | 4.36           | <b>.009</b> |
|            | 12:00      | 12.00          | 4.36           | <b>.006</b> |
|            | 20:00      | -5.33          | 4.36           | .221        |
|            | 00:00      | -3.67          | 4.36           | .400        |
|            | 04:00      | -12.67         | 4.36           | <b>.004</b> |
| 20:00      | 08:00      | 6.00           | 4.36           | .169        |
|            | 12:00      | 6.67           | 4.36           | .126        |
|            | 16:00      | -5.33          | 4.36           | .221        |
|            | 00:00      | 1.67           | 4.36           | .702        |
|            | 04:00      | -7.33          | 4.36           | .092        |
| 00:00      | 08:00      | 7.67           | 4.36           | .079        |
|            | 12:00      | 8.33           | 4.36           | .056        |
|            | 16:00      | -3.67          | 4.36           |             |
|            | 20:00      | 1.67           | 4.36           | .702        |
|            | 04:00      | -9.00          | 4.36           | <b>.039</b> |
| 04:00      | 08:00      | -1.33          | 4.36           | .760        |
|            | 12:00      | -.67           | 4.36           | .878        |
|            | 16:00      | -12.67         | 4.36           | <b>.004</b> |
|            | 20:00      | -7.33          | 4.36           | .092        |
|            | 00:00      | -9.00          | 4.36           | <b>.039</b> |

**Table S6.** Summary of Tukey post-hoc test on cone myoid length ( $\mu\text{m}$ ) across time points in juvenile tarpon in AdvL. Box shading of Time point (i) indicates lighting condition at time of testing (white=light; black=dark). Statistically significant  $p$ -values ( $\alpha \leq 0.05$ ) are in bold.

| (i) Time point | (j) Time point | Mean Difference | Standard Error | $p$ -Value  |
|----------------|----------------|-----------------|----------------|-------------|
|                |                | (i-j)           |                |             |
| 08:00          | 12:00          | -1.31           | 7.17           | 1.000       |
|                | 16:00          | -26.44          | 7.17           | <b>.029</b> |
|                | 20:00          | -53.30          | 7.17           | <b>.000</b> |
|                | 00:00          | -43.33          | 7.17           | <b>.001</b> |
|                | 04:00          | -2.83           | 7.17           | .998        |
| 12:00          | 08:00          | 1.31            | 7.17           | 1.000       |
|                | 16:00          | -25.13          | 7.17           | <b>.039</b> |
|                | 20:00          | -51.99          | 7.17           | <b>.000</b> |
|                | 00:00          | -42.02          | 7.17           | <b>.001</b> |
|                | 04:00          | -1.53           | 7.17           | 1.000       |
| 16:00          | 08:00          | 26.44           | 7.17           | <b>.029</b> |
|                | 12:00          | 25.13           | 7.17           | <b>.039</b> |
|                | 20:00          | -26.86          | 7.17           | <b>.026</b> |
|                | 00:00          | -16.89          | 7.17           | .246        |
|                | 04:00          | 23.60           | 7.17           | .056        |
| 20:00          | 08:00          | 53.30           | 7.17           | <b>.000</b> |
|                | 12:00          | 51.99           | 7.17           | <b>.000</b> |
|                | 16:00          | 26.86           | 7.17           | <b>.026</b> |
|                | 00:00          | 9.97            | 7.17           | .732        |
|                | 04:00          | 50.47           | 7.17           | <b>.000</b> |
| 00:00          | 08:00          | 43.33           | 7.17           | <b>.001</b> |
|                | 12:00          | 42.02           | 7.17           | <b>.001</b> |
|                | 16:00          | 16.89           | 7.17           | .246        |
|                | 20:00          | -9.97           | 7.17           | .732        |
|                | 04:00          | 40.50           | 7.17           | <b>.001</b> |
| 04:00          | 08:00          | 2.83            | 7.17           | .998        |
|                | 12:00          | 1.53            | 7.17           | 1.000       |
|                | 16:00          | -23.60          | 7.17           | .056        |
|                | 20:00          | -50.47          | 7.17           | <b>.000</b> |
|                | 00:00          | -40.50          | 7.17           | <b>.001</b> |

**Table S7.** Summary of Kruskal-Wallis post-hoc pairwise test on cone myoid length ( $\mu\text{m}$ ) in light (or subjective light) hours in four lighting regimes. Statistically significant  $p$ -values ( $\alpha \leq 0.05$ ) are in bold.

| (i) Treatment | (j) Treatment | Test Statistic | Standard Error | $p$ -Value  |
|---------------|---------------|----------------|----------------|-------------|
| <b>LD</b>     | DD            | -14.78         | 4.97           | <b>.018</b> |
|               | AdvL          | 3.89           | 4.97           | .434        |
|               | LL            | 5.78           | 4.97           | .245        |
| <b>DD</b>     | LD            | -14.78         | 4.97           | <b>.018</b> |
|               | AdvL          | 18.67          | 4.97           | <b>.001</b> |
|               | LL            | 20.56          | 4.97           | <b>.000</b> |
| <b>AdvL</b>   | LD            | 3.89           | 4.97           | .434        |
|               | DD            | 18.67          | 4.97           | <b>.001</b> |
|               | LL            | 1.89           | 4.97           | .704        |
| <b>LL</b>     | LD            | 5.78           | 4.97           | .245        |
|               | DD            | 20.56          | 4.97           | <b>.000</b> |
|               | AdvL          | 1.89           | 4.97           | .704        |