Estimating the size of a breeding colony of northern elephant seals from a single census: Supporting information

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Appendix: Complete Correction factors

Correction factors for northern elephant seals to be applied to daily counts of breeding females. Five locations are included, with three Channel Island colonies combined as one. The total number of females over the entire season is calculated by multiplying a single count on a specified day by the Multiplier listed. Credible intervals (95%) for the estimated total number are derived from the columns Lower and Upper. The correction factors are given separately for the five different sites modeled in the main text: Año Nuevo Island (Table A1), Año Nuevo Mainland (Table A2), Point Reyes (Table A3), Channel Islands (Table A4), and King Range (Table A5).
Table A1. Correction factors for converting daily counts of female northern elephant seals into the total breeding female population at Año Nuevo Island. The total population using the colony in a year is estimated by multiplying a count on any date by the given Multiplier. Lower and upper credible intervals (95%) are derived using the columns Lower and Upper.

| Date | Multiplier | Lower  | Upper  |
|------|------------|--------|--------|
| Jan 11 | 1.860     | 1.647  | 2.184  |
| Jan 12 | 1.741     | 1.552  | 2.022  |
| Jan 13 | 1.638     | 1.474  | 1.878  |
| Jan 14 | 1.550     | 1.401  | 1.761  |
| Jan 15 | 1.474     | 1.341  | 1.661  |
| Jan 16 | 1.410     | 1.287  | 1.581  |
| Jan 17 | 1.355     | 1.244  | 1.508  |
| Jan 18 | 1.308     | 1.206  | 1.445  |
| Jan 19 | 1.269     | 1.178  | 1.393  |
| Jan 20 | 1.236     | 1.153  | 1.348  |
| Jan 21 | 1.210     | 1.134  | 1.310  |
| Jan 22 | 1.189     | 1.118  | 1.282  |
| Jan 23 | 1.174     | 1.106  | 1.259  |
| Jan 24 | 1.164     | 1.100  | 1.246  |
| Jan 25 | 1.158     | 1.098  | 1.242  |
| Jan 26 | 1.158     | 1.097  | 1.242  |
| Jan 27 | 1.162     | 1.101  | 1.249  |
| Jan 28 | 1.171     | 1.107  | 1.265  |
| Jan 29 | 1.186     | 1.116  | 1.289  |
| Jan 30 | 1.205     | 1.129  | 1.316  |
| Jan 31 | 1.231     | 1.144  | 1.351  |
| Feb 1  | 1.263     | 1.166  | 1.393  |
| Feb 2  | 1.303     | 1.194  | 1.445  |
| Feb 3  | 1.350     | 1.227  | 1.504  |
| Feb 4  | 1.406     | 1.264  | 1.575  |
| Feb 5  | 1.473     | 1.315  | 1.660  |
| Feb 6  | 1.551     | 1.374  | 1.755  |
| Feb 7  | 1.643     | 1.443  | 1.868  |
| Feb 8  | 1.750     | 1.521  | 2.002  |
Table A2. Correction factors for converting daily counts of female northern elephant seals into the total breeding female population at Año Nuevo Mainland. The total population using the colony in a year is estimated by multiplying a count on any date by the given Multiplier. Lower and upper credible intervals (95%) are derived using the columns Lower and Upper.

| Date   | Multiplier | Lower  | Upper  |
|--------|------------|--------|--------|
| Jan 11 | 2.379      | 2.089  | 3.146  |
| Jan 12 | 2.177      | 1.927  | 2.810  |
| Jan 13 | 2.006      | 1.791  | 2.534  |
| Jan 14 | 1.860      | 1.673  | 2.302  |
| Jan 15 | 1.736      | 1.573  | 2.104  |
| Jan 16 | 1.629      | 1.484  | 1.938  |
| Jan 17 | 1.537      | 1.409  | 1.799  |
| Jan 18 | 1.459      | 1.345  | 1.676  |
| Jan 19 | 1.392      | 1.289  | 1.573  |
| Jan 20 | 1.335      | 1.244  | 1.492  |
| Jan 21 | 1.286      | 1.206  | 1.415  |
| Jan 22 | 1.245      | 1.175  | 1.354  |
| Jan 23 | 1.211      | 1.149  | 1.302  |
| Jan 24 | 1.183      | 1.128  | 1.261  |
| Jan 25 | 1.161      | 1.113  | 1.229  |
| Jan 26 | 1.144      | 1.101  | 1.206  |
| Jan 27 | 1.132      | 1.093  | 1.189  |
| Jan 28 | 1.125      | 1.090  | 1.178  |
| Jan 29 | 1.123      | 1.090  | 1.170  |
| Jan 30 | 1.125      | 1.092  | 1.169  |
| Jan 31 | 1.132      | 1.092  | 1.175  |
| Feb 1  | 1.145      | 1.092  | 1.190  |
| Feb 2  | 1.163      | 1.096  | 1.212  |
| Feb 3  | 1.188      | 1.104  | 1.240  |
| Feb 4  | 1.219      | 1.116  | 1.278  |
| Feb 5  | 1.258      | 1.136  | 1.327  |
| Feb 6  | 1.306      | 1.161  | 1.387  |
| Feb 7  | 1.363      | 1.193  | 1.458  |
| Feb 8  | 1.433      | 1.233  | 1.545  |
Table A3. Correction factors for converting daily counts of female elephant seals into the total breeding female population at Point Reyes. The total population using the colony in a year is estimated by multiplying a count on any date by the given Multiplier. Lower and upper credible intervals (95%) are derived using the columns Lower and Upper.

| Date  | Multiplier | Lower  | Upper  |
|-------|------------|--------|--------|
| Jan 11 | 2.251      | 1.875  | 2.682  |
| Jan 12 | 2.068      | 1.751  | 2.428  |
| Jan 13 | 1.912      | 1.643  | 2.216  |
| Jan 14 | 1.779      | 1.550  | 2.042  |
| Jan 15 | 1.666      | 1.470  | 1.893  |
| Jan 16 | 1.569      | 1.401  | 1.774  |
| Jan 17 | 1.486      | 1.342  | 1.673  |
| Jan 18 | 1.416      | 1.292  | 1.589  |
| Jan 19 | 1.356      | 1.249  | 1.512  |
| Jan 20 | 1.305      | 1.213  | 1.447  |
| Jan 21 | 1.262      | 1.182  | 1.392  |
| Jan 22 | 1.226      | 1.157  | 1.346  |
| Jan 23 | 1.197      | 1.138  | 1.306  |
| Jan 24 | 1.174      | 1.122  | 1.272  |
| Jan 25 | 1.156      | 1.110  | 1.245  |
| Jan 26 | 1.143      | 1.100  | 1.225  |
| Jan 27 | 1.135      | 1.094  | 1.208  |
| Jan 28 | 1.133      | 1.091  | 1.199  |
| Jan 29 | 1.134      | 1.089  | 1.198  |
| Jan 30 | 1.141      | 1.091  | 1.207  |
| Jan 31 | 1.153      | 1.096  | 1.225  |
| Feb 1  | 1.171      | 1.107  | 1.248  |
| Feb 2  | 1.194      | 1.122  | 1.281  |
| Feb 3  | 1.224      | 1.142  | 1.322  |
| Feb 4  | 1.260      | 1.167  | 1.372  |
| Feb 5  | 1.305      | 1.199  | 1.432  |
| Feb 6  | 1.359      | 1.237  | 1.505  |
| Feb 7  | 1.424      | 1.285  | 1.594  |
| Feb 8  | 1.500      | 1.342  | 1.701  |
**Table A4.** Correction factors for converting daily counts of female northern elephant seals into the total breeding female population at Channel Islands. The total population using the colony in a year is estimated by multiplying a count on any date by the given Multiplier. Lower and upper credible intervals (95%) are derived using the columns Lower and Upper.

| Date   | Multiplier | Lower  | Upper  |
|--------|------------|--------|--------|
| Jan 11 | 1.848      | 1.668  | 2.000  |
| Jan 12 | 1.719      | 1.564  | 1.866  |
| Jan 13 | 1.609      | 1.476  | 1.752  |
| Jan 14 | 1.516      | 1.402  | 1.655  |
| Jan 15 | 1.438      | 1.333  | 1.567  |
| Jan 16 | 1.372      | 1.272  | 1.491  |
| Jan 17 | 1.316      | 1.226  | 1.425  |
| Jan 18 | 1.270      | 1.189  | 1.369  |
| Jan 19 | 1.231      | 1.161  | 1.322  |
| Jan 20 | 1.200      | 1.137  | 1.281  |
| Jan 21 | 1.175      | 1.119  | 1.248  |
| Jan 22 | 1.157      | 1.105  | 1.220  |
| Jan 23 | 1.143      | 1.097  | 1.198  |
| Jan 24 | 1.135      | 1.096  | 1.182  |
| Jan 25 | 1.131      | 1.099  | 1.171  |
| Jan 26 | 1.133      | 1.105  | 1.167  |
| Jan 27 | 1.139      | 1.114  | 1.169  |
| Jan 28 | 1.150      | 1.127  | 1.174  |
| Jan 29 | 1.165      | 1.141  | 1.188  |
| Jan 30 | 1.187      | 1.157  | 1.210  |
| Jan 31 | 1.213      | 1.176  | 1.241  |
| Feb 1  | 1.246      | 1.201  | 1.282  |
| Feb 2  | 1.286      | 1.233  | 1.331  |
| Feb 3  | 1.334      | 1.273  | 1.388  |
| Feb 4  | 1.390      | 1.321  | 1.457  |
| Feb 5  | 1.456      | 1.376  | 1.539  |
| Feb 6  | 1.533      | 1.439  | 1.634  |
| Feb 7  | 1.624      | 1.514  | 1.745  |
| Feb 8  | 1.730      | 1.603  | 1.875  |
Table A5. Correction factors for converting daily counts of female northern elephant seals into the total breeding female population at King Range. The total population using the colony in a year is estimated by multiplying a count on any date by the given Multiplier. Lower and upper credible intervals (95%) are derived using the columns Lower and Upper.

| Date    | Multiplier | Lower | Upper |
|---------|------------|-------|-------|
| Jan 11  | 2.712      | 2.207 | 3.376 |
| Jan 12  | 2.460      | 2.053 | 2.992 |
| Jan 13  | 2.247      | 1.910 | 2.673 |
| Jan 14  | 2.067      | 1.796 | 2.433 |
| Jan 15  | 1.913      | 1.681 | 2.223 |
| Jan 16  | 1.782      | 1.580 | 2.048 |
| Jan 17  | 1.671      | 1.488 | 1.907 |
| Jan 18  | 1.575      | 1.408 | 1.779 |
| Jan 19  | 1.493      | 1.341 | 1.679 |
| Jan 20  | 1.423      | 1.281 | 1.592 |
| Jan 21  | 1.364      | 1.233 | 1.516 |
| Jan 22  | 1.313      | 1.192 | 1.455 |
| Jan 23  | 1.270      | 1.156 | 1.402 |
| Jan 24  | 1.234      | 1.127 | 1.360 |
| Jan 25  | 1.205      | 1.106 | 1.323 |
| Jan 26  | 1.181      | 1.089 | 1.290 |
| Jan 27  | 1.163      | 1.077 | 1.268 |
| Jan 28  | 1.149      | 1.069 | 1.247 |
| Jan 29  | 1.141      | 1.067 | 1.242 |
| Jan 30  | 1.137      | 1.065 | 1.235 |
| Jan 31  | 1.137      | 1.063 | 1.241 |
| Feb 1   | 1.143      | 1.067 | 1.258 |
| Feb 2   | 1.154      | 1.073 | 1.270 |
| Feb 3   | 1.170      | 1.083 | 1.290 |
| Feb 4   | 1.191      | 1.095 | 1.323 |
| Feb 5   | 1.219      | 1.110 | 1.366 |
| Feb 6   | 1.255      | 1.132 | 1.412 |
| Feb 7   | 1.298      | 1.157 | 1.472 |
| Feb 8   | 1.350      | 1.193 | 1.541 |
Appendix 2: Subcolonies at Año Nuevo Mainland

Correction factors and census timing at two subcolonies within the mainland colony at Año Nuevo Mainland, a South Point and a North Point. These are often counted separately. Correction factors, as in the main Appendix, are in Tables A6, A7. Timing of the census at the two mainland subcolonies, plus the Año Nuevo Island colony (which is also graphed in the main text), are shown in Figs A1, A2.
Table A6. Correction factors for converting daily counts of female northern elephant seals into the total breeding female population at Año Nuevo Mainland South. The total population using the colony in a year is estimated by multiplying a count on any date by the given Multiplier. Lower and upper credible intervals (95%) are derived using the columns Lower and Upper.

| Date  | Multiplier | Lower  | Upper  |
|-------|------------|--------|--------|
| Jan 11 | 2.419      | 2.063  | 2.947  |
| Jan 12 | 2.212      | 1.907  | 2.640  |
| Jan 13 | 2.036      | 1.775  | 2.390  |
| Jan 14 | 1.886      | 1.662  | 2.181  |
| Jan 15 | 1.758      | 1.565  | 2.004  |
| Jan 16 | 1.648      | 1.482  | 1.867  |
| Jan 17 | 1.554      | 1.411  | 1.740  |
| Jan 18 | 1.474      | 1.350  | 1.633  |
| Jan 19 | 1.405      | 1.299  | 1.544  |
| Jan 20 | 1.346      | 1.256  | 1.473  |
| Jan 21 | 1.296      | 1.220  | 1.411  |
| Jan 22 | 1.254      | 1.191  | 1.357  |
| Jan 23 | 1.218      | 1.165  | 1.310  |
| Jan 24 | 1.189      | 1.145  | 1.271  |
| Jan 25 | 1.166      | 1.128  | 1.240  |
| Jan 26 | 1.147      | 1.113  | 1.211  |
| Jan 27 | 1.134      | 1.102  | 1.187  |
| Jan 28 | 1.126      | 1.093  | 1.172  |
| Jan 29 | 1.122      | 1.088  | 1.162  |
| Jan 30 | 1.124      | 1.087  | 1.161  |
| Jan 31 | 1.130      | 1.089  | 1.173  |
| Feb 1  | 1.141      | 1.095  | 1.195  |
| Feb 2  | 1.158      | 1.104  | 1.224  |
| Feb 3  | 1.181      | 1.119  | 1.257  |
| Feb 4  | 1.210      | 1.139  | 1.301  |
| Feb 5  | 1.247      | 1.161  | 1.353  |
| Feb 6  | 1.293      | 1.192  | 1.417  |
| Feb 7  | 1.348      | 1.229  | 1.487  |
| Feb 8  | 1.414      | 1.273  | 1.574  |
Table A7. Correction factors for converting daily counts of female northern elephant seals into the total breeding female population at Año Nuevo Mainland North. The total population using the colony in a year is estimated by multiplying a count on any date by the given Multiplier. Lower and upper credible intervals (95%) are derived using the columns Lower and Upper.

| Date  | Multiplier | Lower | Upper |
|-------|------------|-------|-------|
| Jan 11 | 2.458      | 1.846 | 3.390 |
| Jan 12 | 2.222      | 1.713 | 2.976 |
| Jan 13 | 2.025      | 1.589 | 2.655 |
| Jan 14 | 1.861      | 1.492 | 2.382 |
| Jan 15 | 1.724      | 1.400 | 2.155 |
| Jan 16 | 1.609      | 1.328 | 1.972 |
| Jan 17 | 1.512      | 1.273 | 1.817 |
| Jan 18 | 1.431      | 1.225 | 1.687 |
| Jan 19 | 1.363      | 1.185 | 1.577 |
| Jan 20 | 1.306      | 1.154 | 1.483 |
| Jan 21 | 1.258      | 1.128 | 1.405 |
| Jan 22 | 1.219      | 1.112 | 1.338 |
| Jan 23 | 1.188      | 1.101 | 1.287 |
| Jan 24 | 1.162      | 1.093 | 1.250 |
| Jan 25 | 1.143      | 1.084 | 1.222 |
| Jan 26 | 1.130      | 1.074 | 1.218 |
| Jan 27 | 1.121      | 1.061 | 1.225 |
| Jan 28 | 1.117      | 1.051 | 1.237 |
| Jan 29 | 1.118      | 1.046 | 1.257 |
| Jan 30 | 1.123      | 1.042 | 1.279 |
| Jan 31 | 1.133      | 1.042 | 1.304 |
| Feb 1  | 1.149      | 1.045 | 1.337 |
| Feb 2  | 1.169      | 1.053 | 1.374 |
| Feb 3  | 1.196      | 1.064 | 1.420 |
| Feb 4  | 1.229      | 1.075 | 1.468 |
| Feb 5  | 1.270      | 1.091 | 1.537 |
| Feb 6  | 1.320      | 1.114 | 1.609 |
| Feb 7  | 1.379      | 1.143 | 1.692 |
| Feb 8  | 1.449      | 1.179 | 1.784 |
Figure A1. Arrival date at Año Nuevo. Arrival date at three Año Nuevo subcolonies as estimated from the census model (ANI: Año Nuevo Island; ANSP: Año Nuevo South Point; ANNP: Año Nuevo North point). Dashed vertical lines show 95% credible intervals in each year. At the far right, open circles and solid lines show the overall mean (all years combined) at all three subcolonies. See main text Fig 3A.
Figure A2. Date of peak census at Año Nuevo. Peak female count at three Año Nuevo subcolonies as estimated from the census model comparing three subcolonies at Año Nuevo (ANI: Año Nuevo Island; ANSP: Año Nuevo South Point; ANNP: Año Nuevo North Point). Dashed vertical lines show 95% credible intervals in each year. At the far right, open circles and solid lines show the overall mean (all years combined) at all three subcolonies. See main text Fig 3B.