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David N. Koons, Randall R. Holmes, and James B. Grand. 2007. Population inertia and its sensitivity to changes in vital rates and population structure. *Ecology* 88:2857–2867.

Appendix C. Technical details of the example depicting age-related dynamics of inertia in a human population open to migration.

It is relatively straightforward to incorporate net immigration into projection models (e.g., Rogers 1995), but Cooch et al. (2001) present a concise model for incorporating birth, survival, immigration, and emigration vital rates into a single projection matrix:

$$\mathbf{A} = \begin{bmatrix} 0 & \cdots & m_x S_0 \eta_0 & \cdots & m_x S_0 \eta_0 \\ S_x \eta_x + I_x & 0 & 0 & \cdots & 0 \\ 0 & \ddots & 0 & \cdots & 0 \\ \vdots & 0 & \ddots & \vdots & \vdots \\ 0 & 0 & 0 & S_x \eta_x + I_x & 0 \end{bmatrix}$$

where **A** is constructed in the traditional pre-breeding census format (Caswell 2001), m_x is the average number of births per female in age- or stage-class *x*, S_0 is the probability of surviving from birth to census in age- or stage-class 1, S_x is the probability of surviving from age- or stage-class *x* to *x* + 1, η_0 and η_x are the corresponding probabilities of remaining in the population, conditional on being alive (i.e., 1 – emigration probability, which is called site fidelity), and I_x is the probability that an individual present in the population at time *t* in age- or stage-class *x* + 1 was not present in the population at time *t* – (census time) in age- or stage-class *x* (i.e., the probability of immigrating during the time between censuses from outside the local population). Therefore, the quantity $S_x \eta_x + I_x$ represents the 'rate' at which individuals transition from age- or stage-class *x* to *x* + 1 during the time between censuses, and can potentially be > 1 due to immigration. In the example presented here, we parameterized this model (**A**) with data based on a female segment of the U.S. population < 50 years old, counted at 5-year intervals, and growing by 1% per year (Table C1). Data were attained from the 1980, U.S. Southwest life tables presented in Rogers (1995), but adjusted to fit our example described above. We assumed that the population initially had a stable population structure and then applied Eqs. 13, 14, and 16 to calculate the elasticity of the SER to changes in each of the aforementioned vital rates. The Supplement contains Matlab scripts for conducting this example.

LITERATURE CITED

Caswell, H. 2001. Matrix population models: Construction, analysis, and interpretation. Second edition. Sinauer Associates, Sunderland, Massachusetts, USA.

Cooch, E. G., R. F. Rockwell, and S. Brault. 2001. Retrospective analysis of demographic responses to environmental change: an example in the lesser snow goose. Ecological Monographs **71**:377–400.

Rogers, A. 1995. Multiregional demography: Principles, methods and extensions. Wiley, New York, New York, USA.

TABLE C1. Values of survival probability (S), local population fidelity (η), immigration probability (I) and fecundity (m, female births per female between and including age x and x + 4) for the female segment of the U.S. Southwest population < 50 years old, counted at 5-year intervals, and growing by 1 % per year.

	Vital Rates			
Age x	S	η	I	m
0	0.938	0.956	-	0
5	0.971	0.973	0.087	0.0008
10	0.977	0.979	0.076	0.0978
15	0.968	0.974	0.102	0.2880
20	0.956	0.963	0.144	0.3698
25	0.955	0.962	0.144	0.2760
30	0.962	0.970	0.104	0.1313
35	0.969	0.978	0.065	0.0389
40	0.970	0.985	0.042	0.0067
45	0.966	0.988	0.030	0.0004

[Back to E088-177]