

1 **APPENDIX**

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3 **Effects of variations in yearling, juvenile and adult survival on reef manta ray (*Manta***
4 ***alfredi*) demography and population change**

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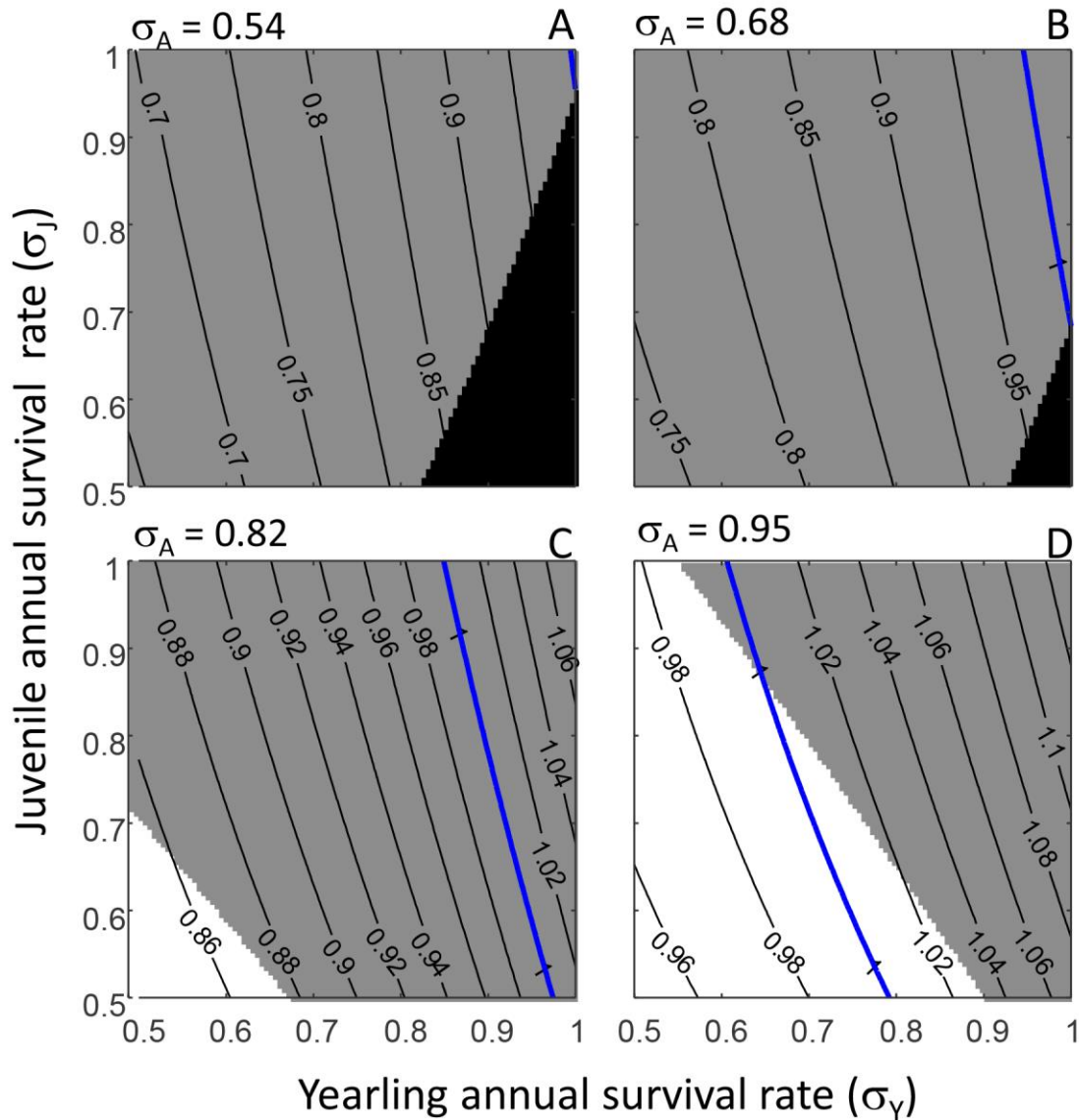
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Population growth rate (λ)



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19 **Population growth rate and sensitivity results.** Predicted population growth rate λ in relation
20 to yearling annual survival rate (σ_Y) and juvenile annual survival rate (σ_J) shown for each of four
21 values of adult annual survival rate (σ_A): $\sigma_A = 0.54$ (80% of observed rate) (A); $\sigma_A = 0.68$
22 (observed rate) (B); $\sigma_A = 0.82$ (120% of observed rate) (C); and $\sigma_A = 0.95$ (140% of observed
23 rate) (D). In each panel, isoclines denote equal values of the population growth rate λ . The blue

24 line in each panel denotes population stability at $\lambda = 1$; values higher than $\lambda = 1$ denote increasing
25 populations and value lower than $\lambda = 1$ denote declining populations. The grey, black and white
26 areas in panels denote the sensitivity results: white areas denote parameter combinations where
27 the population growth rate is most sensitive to P_A , the rate at which adults survive and remain in
28 the adult stage (Equation 3); grey areas denote parameter combinations where the population
29 growth rate is most sensitive to G_J , the rate at which juveniles survive and grow into the adult life
30 stage (Equation 3); black areas denote parameter combinations where the population growth rate
31 is most sensitive to P_J , the rate at which juveniles survive and remain in the juvenile life stage
32 (Equation 3).