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Table S1. Summary of the notation, description and distribution (where applicable) for all input, model, output and risk analysis parameters.

Input Parameters	Description	Distribution
M	Natural Mortality	$T(a = 0.011, b = 0.101, c = 0.054)$
F	Fishing Mortality	No distribution
Z	Total Mortality, $Z = F+M$	Based on the M distribution
l_i	Survivorship at age, $l_i = l_{i-1}e^{-Z}$	Based on the M distribution
t_{max}	Longevity, $t_{max} = -\ln(0.01)/M$	Based on the M distribution
t_c	Age at first capture	$U(a = 0, b = 60)$
s_c	Stage at first capture	$U(a$ = neonate, b = adult-pregnant)
t_m	Age at 50% maturity	$N(\mu = 34, \sigma = 7)$
b_i	Age specific female fecundity	Varies by age, $N(\mu$ = 0-4, σ = 1-1.7)
b_x	Stage specific female fecundity	$N(\mu = 5, \sigma = 1.7)$
Model Parameters	**Description**	
f_i	Age specific fertility	
σ_x	Probability of surviving stage x	
g_x	Probability of shifting out of stage x	
G_x	Probability of an individual surviving and shifting to another stage	
P_x	Probability of an individual surviving and staying in current stage	
t_x	Stage duration in years	
λ_{init}	Initial population growth rate	
Output Parameters	**Description**	
r	Instantaneous rate of increase (also called the rebound potential)	
λ	Population growth rate	
R_0	Net reproductive rate, the total number of female offspring produced per individual in a single cohort	
T	Generation time, the time for the population to increase by $R0$	
μ_1	Mean age of the parents of a cohort	
t_{x2}	Population doubling time	
e_{kj}	Elasticities of r, estimates how r is affected by changes to either survivorship or fecundity	
Risk Assessment Parameters	**Description**	
MSY	Maximum sustainable yield	
B_{MSY}	Biomass maintained at MSY	
$B_{35\%}$, $B_{40\%}$	Biomass that is 35% or 40% of virgin biomass	
F_{MSY}, $F_{35\%}$, $F_{40\%}$	Fishing mortality associated with maintaining biomass levels	
F_J	Fishing mortality for all juveniles	
F_S	Fishing mortality for all sub-adults (stage model only)	
F_A	Fishing mortality for all adults	

Fig. S1. Life cycle diagrams for age (top) and stage models (bottom) used in this study. Numbers represent ages and capital letters represent stages, N = neonate, J = juvenile, S = sub-adult, AP = adult-pregnant, and AR = adult-resting. The age model has 120 age classes; parallel diagonal lines indicate breaks in the age structure not shown in the diagram (removed for clarity), t_m and t_{max} represent the age at maturity and maximum age. Straight arrows from left to right represent the progression from one age class or stage to the next. Curved arrows above the diagram represent feedback to previous ages or stages and the curved arrows below the diagram indicate a feedback loop to the same stage, indicating that an animal does not progress to the next stage.

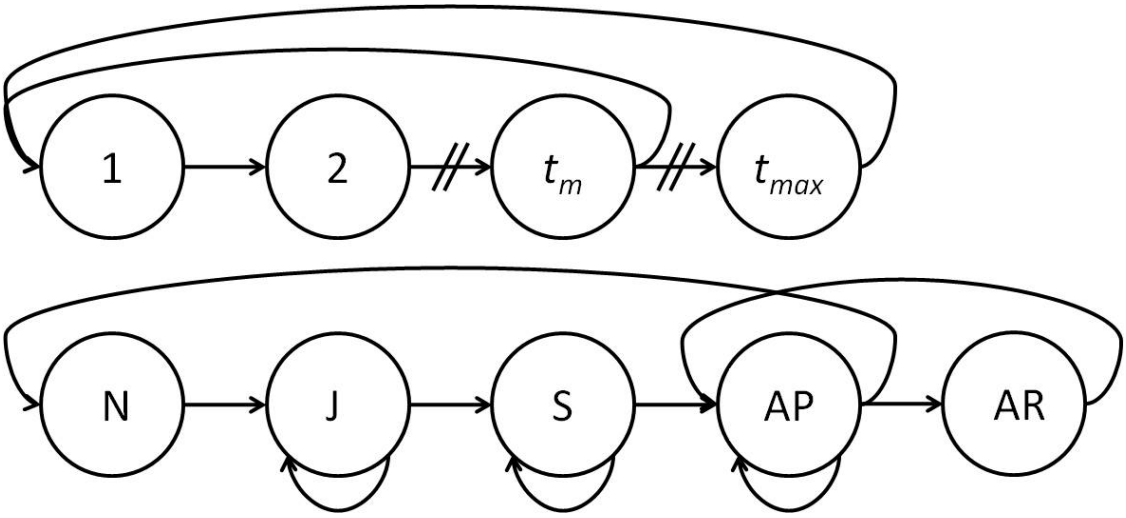

Fig. S2 Probability density and mass functions of input parameters for the age-based and stage-based models. (a) Survival and (b) longevity were assigned triangular distributions based on the median, minimum and maximum estimates of natural mortality; longevity densities were not estimated for the stage model because that model is not age dependent. (c) Age at maturity was only estimated for the age model, by definition. (d) Female fecundity for the stage model was assigned a random normal distribution with average and standard deviation values based on all dogfish data. Finally, to estimate (e) female fecundity for all age classes, each class was randomly assigned a fecundity value from a normal distribution specific to that age class.

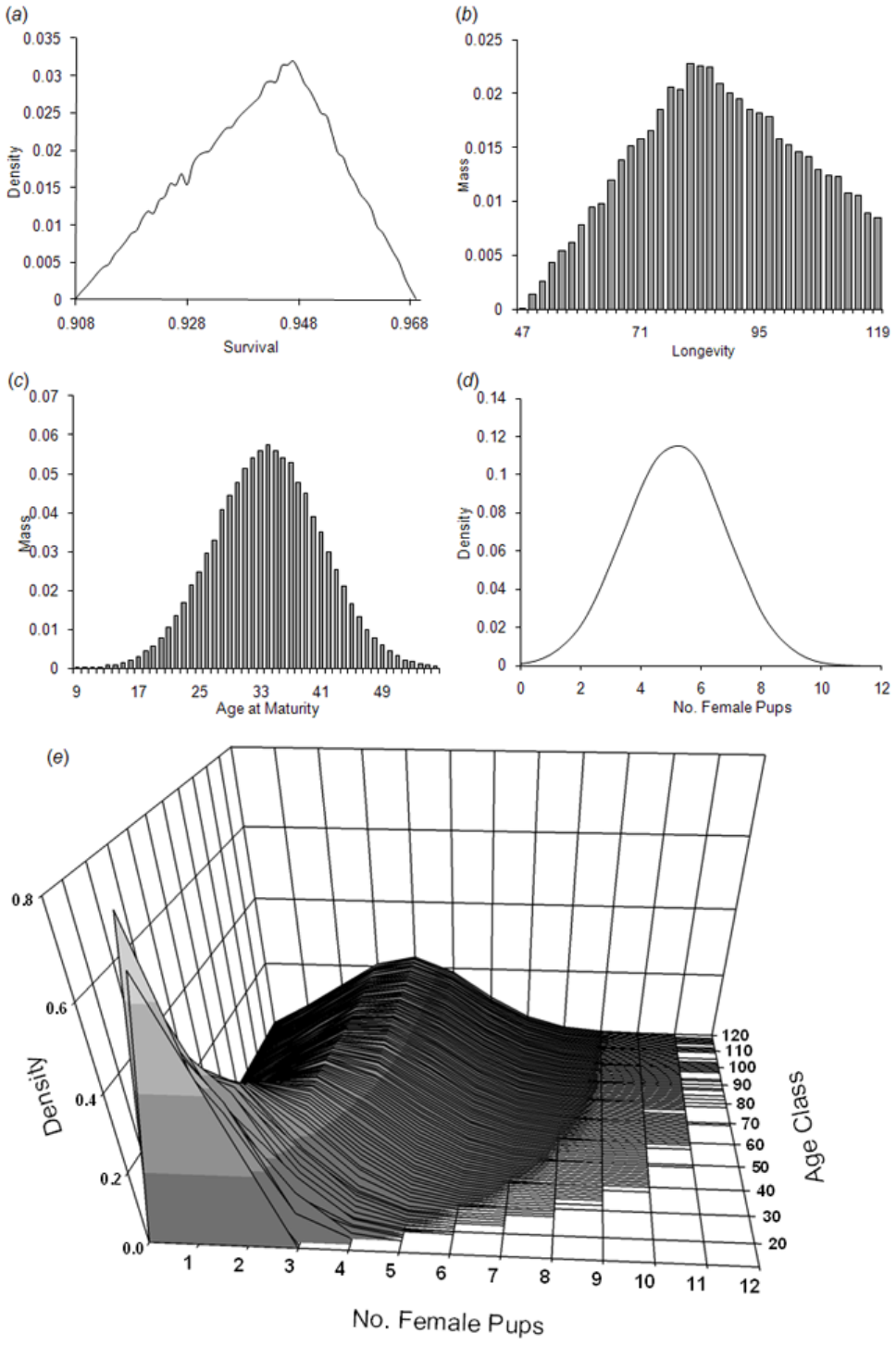

Fig. S3 Estimates of (a) rebound potential, (b) net reproductive rate, (c) population growth, (d) population doubling rate, (e) mean age of parent, and (f) generation time for the age-based model (AM) and stage-based model (SM).