SUPPLEMENTAL

Trade-offs between risks of predation and starvation in larvae make the shelf break an optimal spawning location for Atlantic Bluefin tuna

S1 Model Parameters

Table S1: Model parameters description and values referenced in equations and parameter sensitivity experiments.

Parameter			Units	Value
Tunable Model Parameters				
Symbol	**Name**	**Description**		
V	SwmSpd	Cruise swimming speed	Body length s^{-1}	2.0
Φ	Vis2DFac	Two dimensional field of view fraction	Non-Dim.	0.5
ϵ	GrossGrowthEff	Gross growth efficiency	% Ingestion	0.3
A	AssimEff	Absorption efficiency	% Ingestion	0.7
σ_p	CaptSucc	Capture success	Non-Dim.	0.75
t_c	Q10Temp	Metabolic requirement temperature dep.	$°C^{-1}$	0.0693
t_c	Q10Temp	Yolk-sac temperature dep.	$°C^{-1}$	0.0693
t_c	Q10Temp	Growth (in length) temperature dep.	$°C^{-1}$	0.0693
t_c	Q10Temp	Gut turnover temperature dep.	$°C^{-1}$	0.0693
L_{PZ}	PZlen	Average length of Predatory Zoo. (PZ)	mm	2.0
‘’	StarvMax	Maximum starvation rate	d^{-1}	0.3
‘’	PONRmort	Point-of-no return starvation rate	d^{-1}	1.0
‘’	PONRfrac	Point-of-no-return threshold	% Body mass	0.25
‘’	GutFull	Gut fullness	% Body mass	0.1
‘’	GutTurn	Gut turnover time at 26°C	hours	3.0
‘’	BasePredMort	Minimum predation rate	d^{-1}	0.05
‘’	ExogFeedAge	Age at exogenous feeding at 26°C	Days post hatch	2.0
‘’	LarvLightHalfSat	Aksnes et al visual light parameter	Watts m^{-2}	1.0869
‘’	MRD2BRD	Max Reactive Dist / Behav React Dist		2.0
c_f		Carbon fraction	Non-Dim.	0.4
‘’		Egg diameter	mm	1.0
‘’		Assumed water temp of collected larvae	°C	26
‘’		Temp. Adj for Equation S2 MED-GOM	°C	-2
Fitted Relationship Parameters				
Symbol	**Name**	**Description**		
‘’	HatchTime_p1	Equation S1 – Parameter 1		4.66
‘’	HatchTime_p2	Equation S1 – Parameter 2		-0.11
‘’	HatchProb_p1	Equation S2 – Parameter 1		-1.27
‘’	HatchProb_p2	Equation S2 – Parameter 2		63.78
‘’	HatchProb_p2	Equation S2 – Parameter 3		727.98
‘’	Age2Weight_p1	Equation S3 – Parameter 1		0.0547
‘’	Age2Weight_p2	Equation S3 – Parameter 2		0.2157
‘’	Age2Weight_std_p1	Standard Deviation (Age2Weight_p1)		0.0052
‘’	Age2Weight_std_p2	Standard Deviation (Age2Weight_p2)		0.0108
‘’	max_Age2Weight_p1	Equation S4 – Parameter 1		0.1128
‘’	max_Age2Weight_p1	Equation S4 – Parameter 2		0.1714

‘’	Age2Length_p1	Equation S5 – Parameter 1		0.4433
‘’	Age2Lenght_p2	Equation S5 – Parameter 2		1.8590
‘’	Age2Lenght_std_p1	Standard Deviation (Age2Weight_p1)		0.011
‘’	Age2Length_std_p2	Standard Deviation (Age2Weight_p2)		0.0802
‘’	upp_LarvLen2PreyLen_p1	Equation S6 – Parameter 1		0.071
‘’	upp_LarvLen2PreyLen_p2	Equation S6 – Parameter 2		0.22
‘’	low_LarvLen2PreyLen_p1	Equation S7 – Parameter 1		0.015
‘’	low_LarvLen2PreyLen_p2	Equation S7 – Parameter 2		0.04
‘’	MinSepAng_p1	Equation S8 – Parameter 1		4.699
	MinSepAng_p2	Equation S8 – Parameter 2		-1.129

S2 Parameter sensitivity

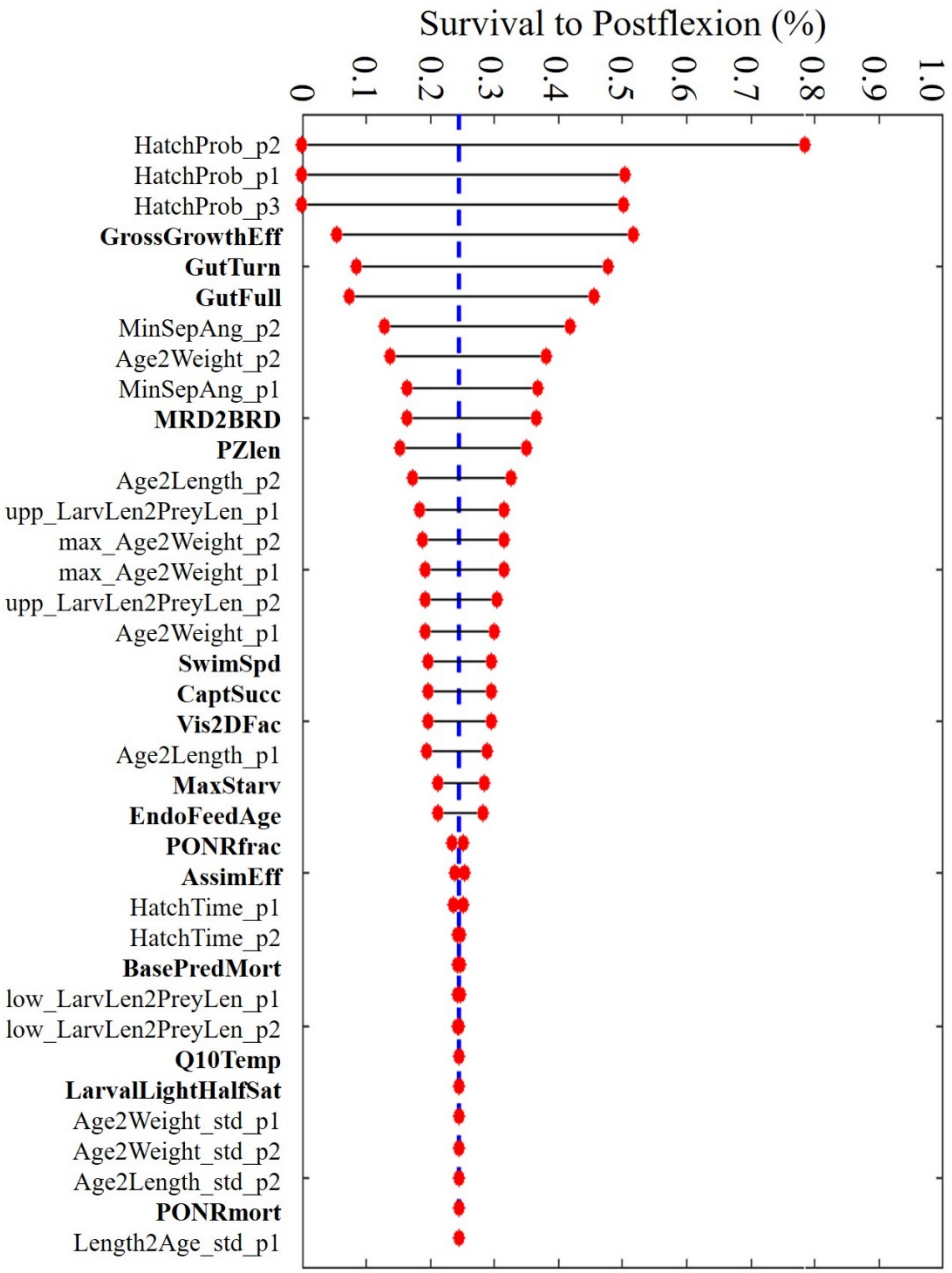

Figure S1: Survival to postflexion for 37 independent parameter sensitivity runs which included -10%/+10%. Bolded parameters are "tunable" model parameters while non-bolded text indicates parameters that are part of fitted relationships derived from field data.

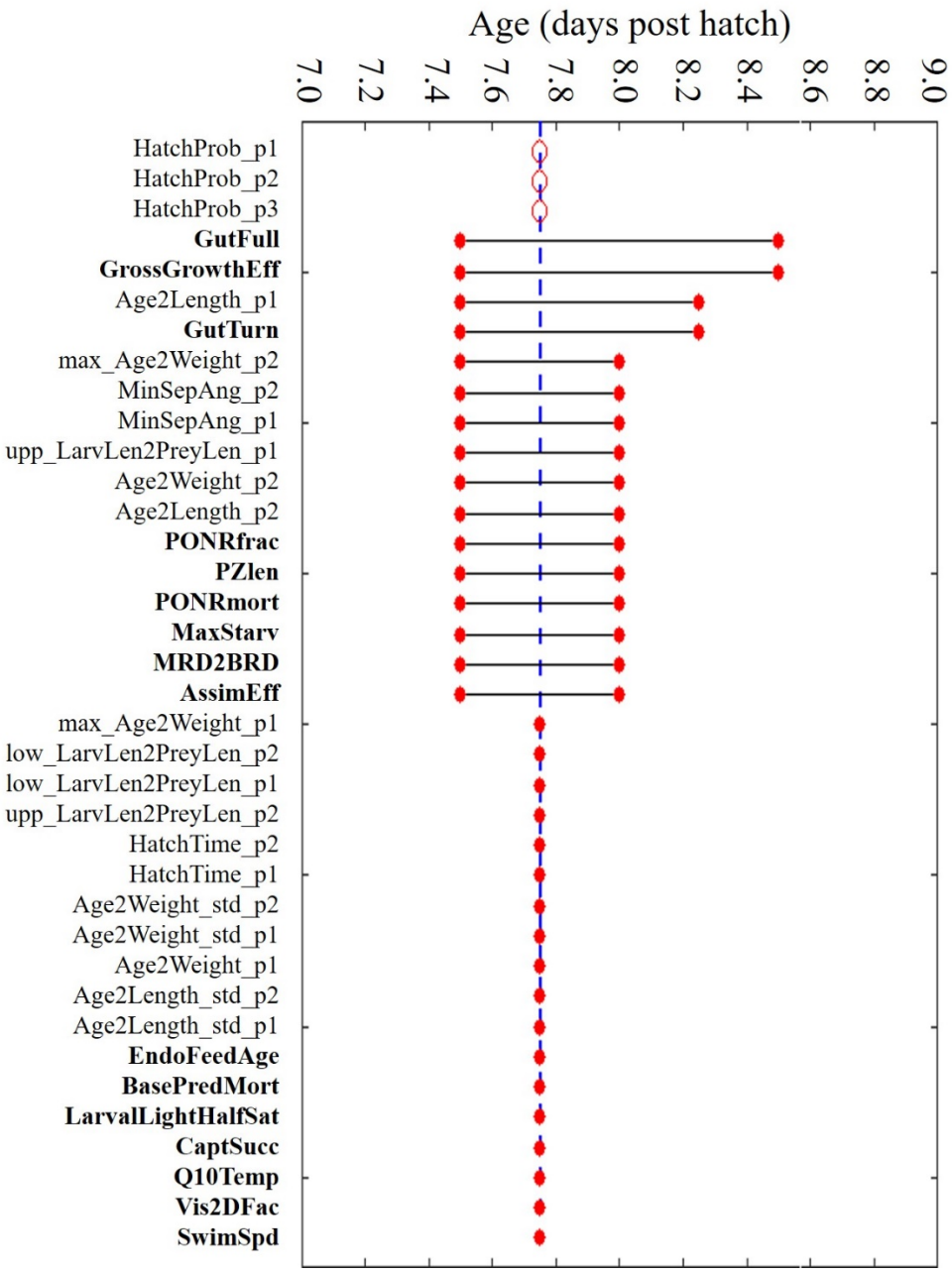

Figure S2: Age at which starvation and predation become approximately equal calculated for 37 independent parameter sensitivity runs which included -10%/+10%. Bolded parameters are "tunable" model parameters while non-bolded text indicates parameters that are part of fitted relationships derived from field data.

S3 Model diagnostics

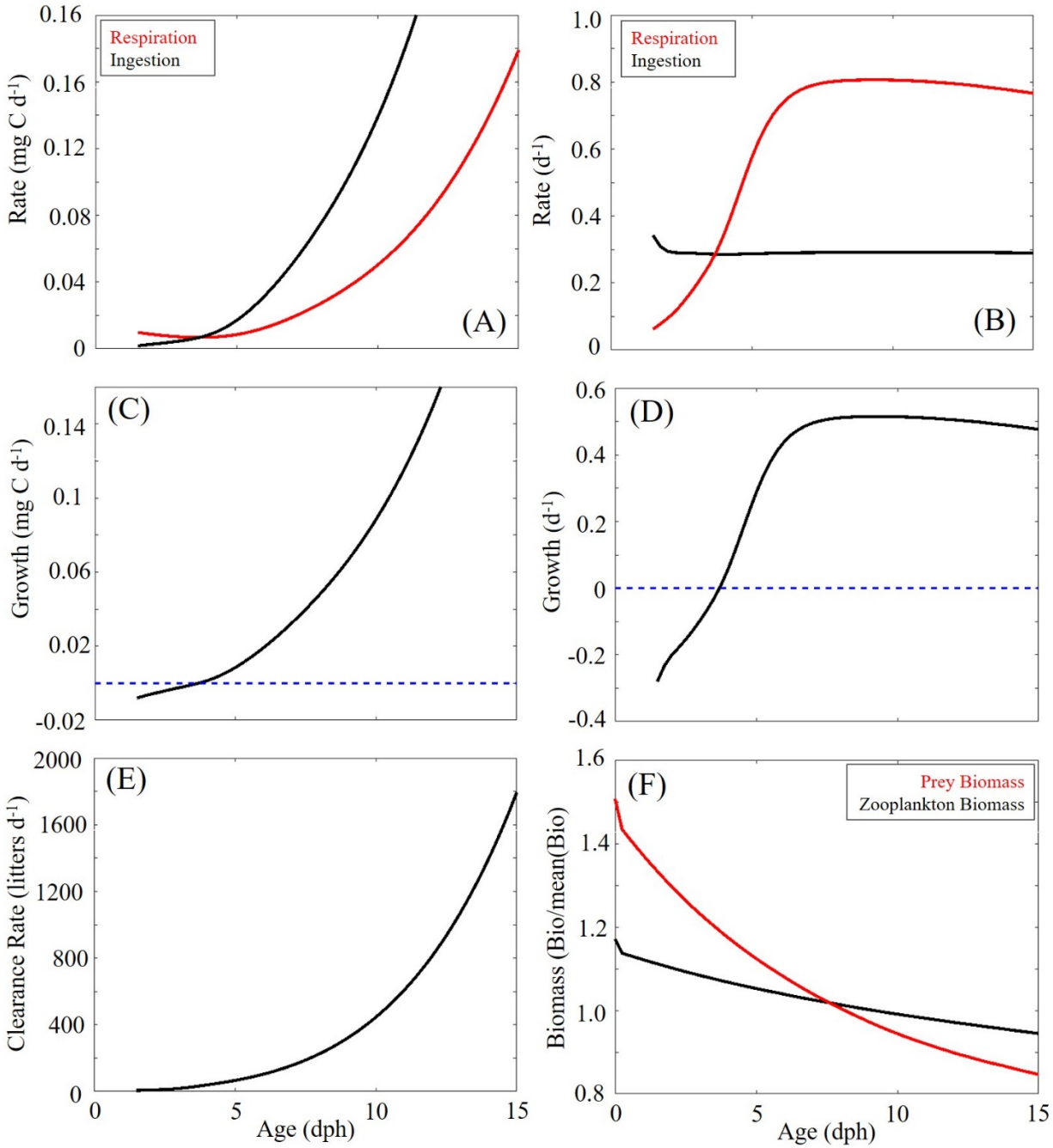

Figure S3: (A) Larval respiration and ingestion (mg C d^{-1}) as a function on larval age (days post hatch). (B) Respiration and ingestion (d^{-1}) normalized to larval weight as a function of larval age. (C) Larval growth and (D) specific growth as a function of larval age. (E) Clearance (liters d^{-1}) as a function of larval age. (F) Zooplankton and prey biomass normalized to their respective average biomass.

S4 Model equations

Egg stage (required hours to hatch):

$$h = 4.66 \cdot \exp(-0.11 \cdot \theta) \quad \text{(eq. S1)}$$

Hatch probability

$$x = -1.27 \cdot \theta^2 + 63.78 \cdot \theta - 727.98 \quad \text{(eq. S2)}$$

Age to weight relationship

$$W = 0.0547 \pm 0.0052 \cdot \exp(0.2157 \pm 0.0108 \cdot A) \quad \text{(eq. S3)}$$

Maximum age to weight relationship

$$W = 0.1128 \cdot \exp(0.1714 \cdot A) \quad \text{(eq. S4)}$$

Age to length relationship

$$L = (0.4433 \pm 0.0111 \cdot A + 1.8590 \pm 0.0802) \quad \text{(eq. S5)}$$

Larval length to prey length (upper bound)

$$L_P = 0.071 \cdot L_T + 0.22 \quad \text{(eq. S6)}$$

Larval length to prey length (lower bound)

$$L_P = 0.015 \cdot L_T + 0.04 \quad \text{(eq. S7)}$$

Minimum Separable Angle

$$MSA = 4.699 \cdot L_T^{-1.129} \quad \text{(eq. S8)}$$