Spiny dogfish dynamic range model

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8/19/2020

Right now the simulations for spiny dogfish are being generated in Python. Let's load in the output and explore it.

Parameter estimates

parameter	estimate
L_0	2.2375005
L_inf	117.2415191
L_J	39.7500000
L_Y	67.5000000
Topt	11.7592243
width	1.6688454
kopt	0.4794329
xi	0.0987868
m_J	0.0474717
m_Y	0.0028057
m_A	0.0162324
K	321.5644231

How do these parameters compare to what is known about spiny dogfish mortality?

Length

L_J and L_Y are set by us as values known without error. L_Y is the mean length at maturity between females and males of the species (in cm). L_J is the break point between juveniles and young adults; we defined this as halfway between the size at maturity, L_Y, and the minimum length caught in the survey (not reported in this parameter table but we can extrapolate that it was 12 cm). Our value of 39.75cm reconciles well with SAW 43 (p33), which states that "Dogfish less than 36 cm represent individuals less than one year old at the time of the survey and are considered as recruits to the population." I'm not sure how to interpret the estimated L_0; I think it is mostly a theoretical value in Von Bertalanffy growth, so this very small value seems fine. L_inf for females in SAW 43 was reported to be 105 cm, slightly smaller than what our model estimated.

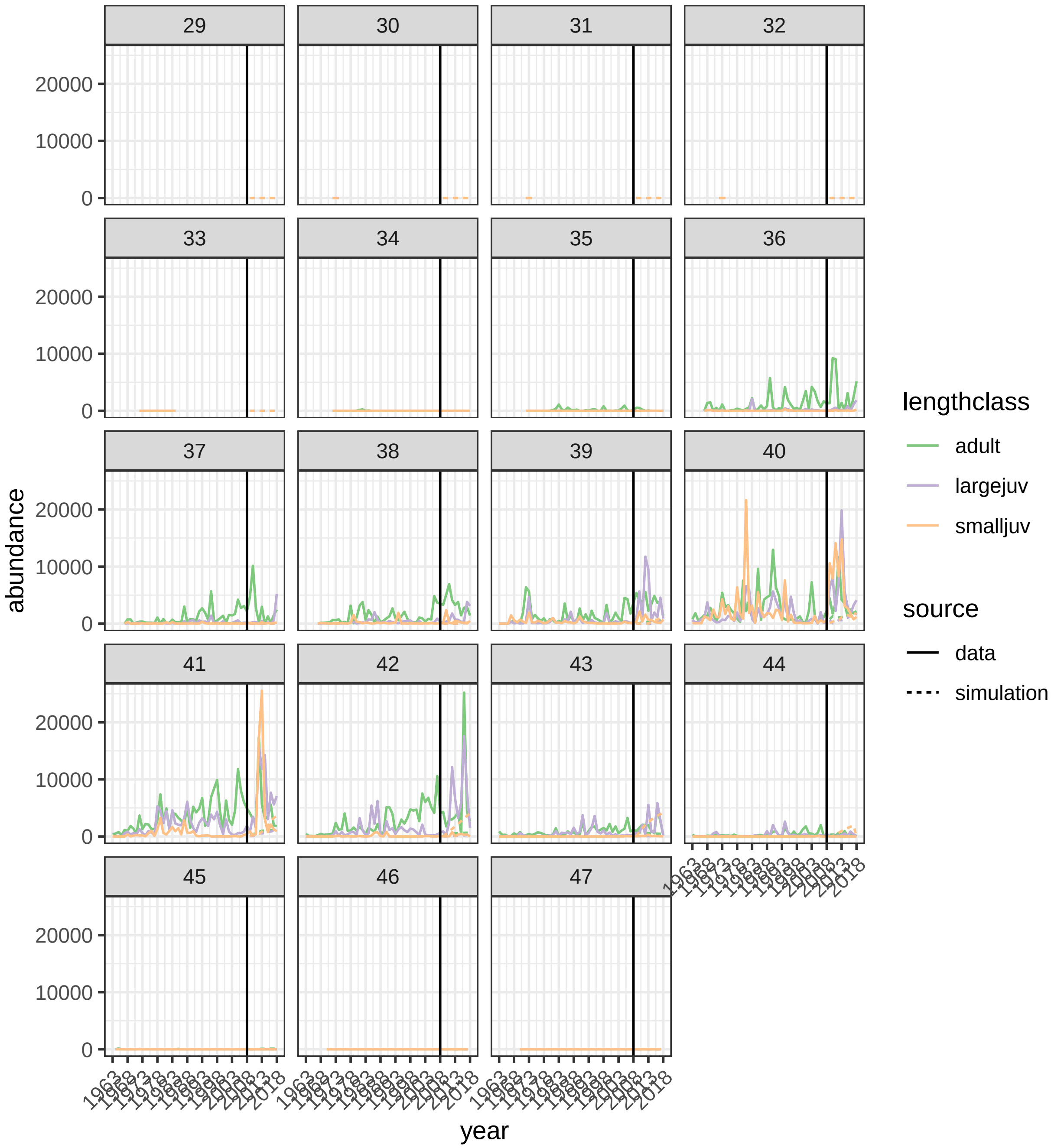
Mortality

Mortality in fisheries is usually decomposed into (at least) two proportions of adults that die every year: M, natural mortality, and F, fishing mortality. The sum of these may be denoted Z and is likely most comparable to our estimated m_A because we did not attempt to disentangle sources of mortality. While actual values of F have varied markedly during the fishery's history–up to values of 0.6 (SAW 43 Figure B7.1)–the target value is 0.08 and the threshold value is 0.11 (SAW 43, p34). SAW 43 used estimates for M ranging from 0.06 to 0.092. Thus, assuming the units are the same (a dimensionless proportion of total biomass–although perhaps our model used proportion of individuals?) our estimate for m_A may be far too low.

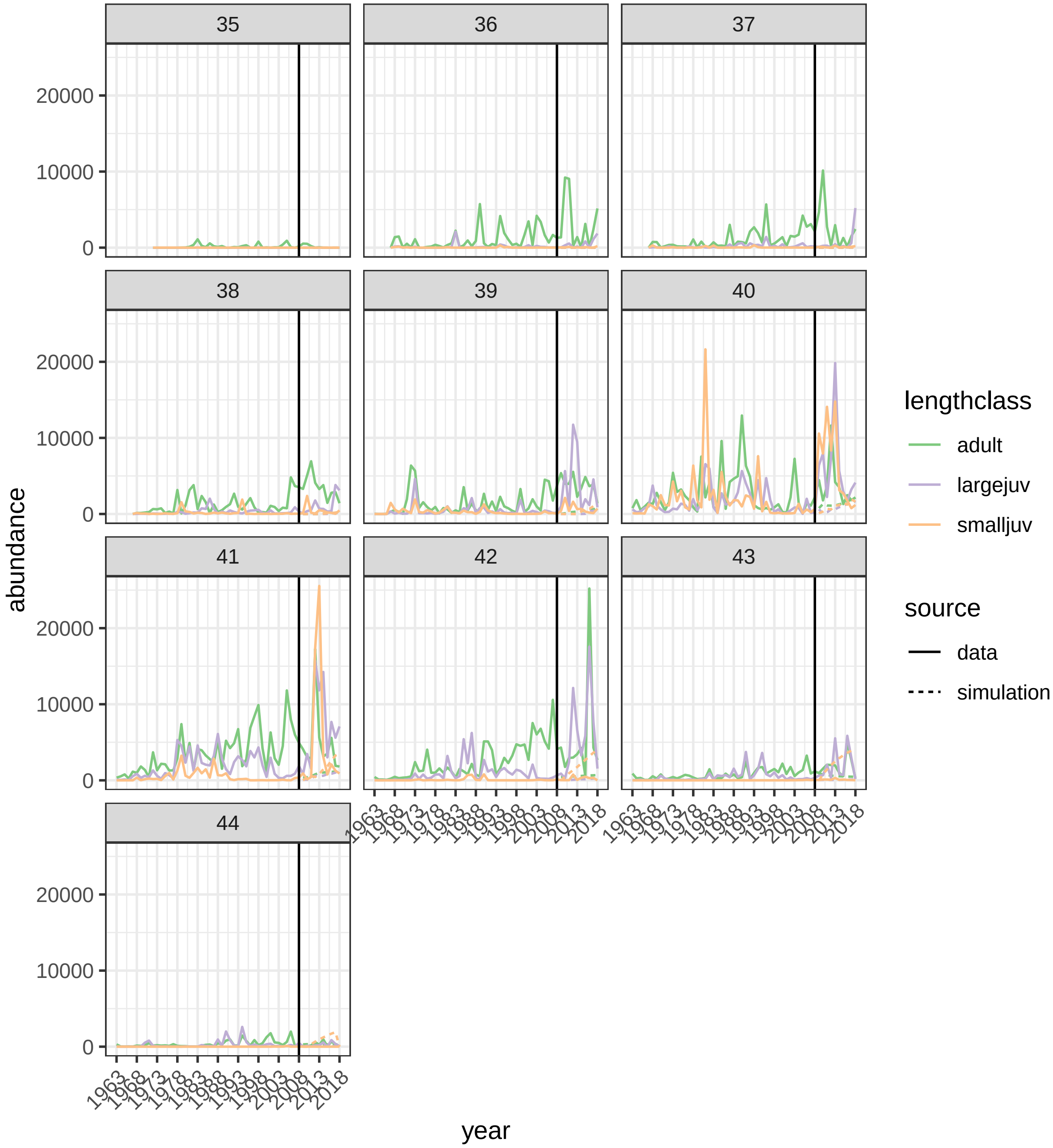
I'm not sure where to look for empirical estimates of m_Y or m_J.

Simulated abundance

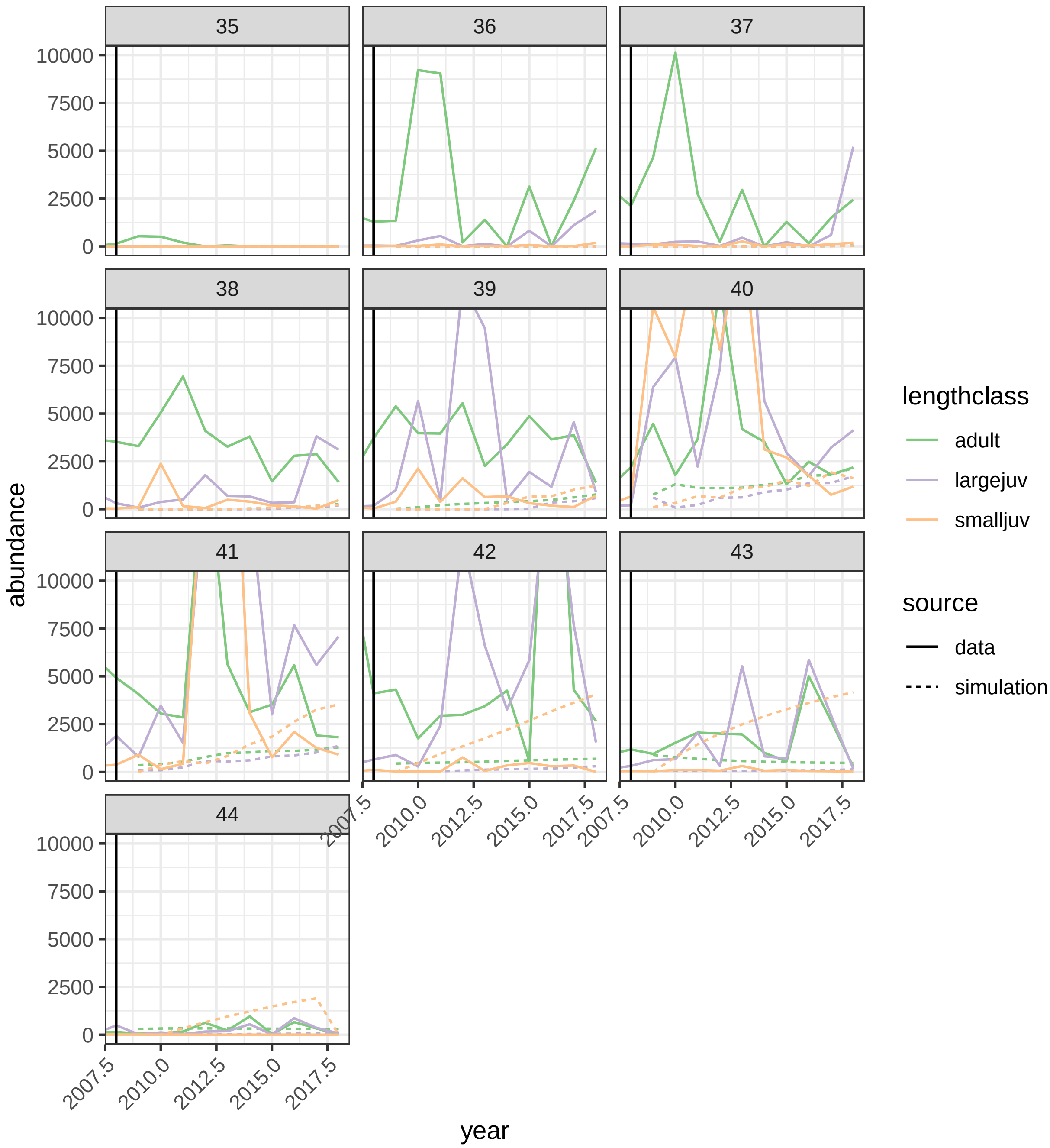
Let's look at the real and simulated abundances (number of individuals) for the three size classes across all patches and years.



Most patches have basically no individuals at any time, possibly because they fall beyond the survey's regularly sampled extent. To get a better handle on the model performance, let's zoom in on 35N (Cape Hatteras) to 44N (central Maine coast). These latitude bands are defined by simple rounding, so 40 degrees includes everything from 39.51N to 40.49N.



And because the simulations are hard to see given the big peaks in abundance for the last 10 years, let's zoom in on just those years and ignore some of the peaks:



(Ignore the funky year labels.)

Absolute biomass

Compare what the model says about total abundance to the stock assessment