Improving Catch Estimation Methods in Sparsely Sampled, Mixed Stock Fisheries.

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UCSC :: CSTAR :: SWFSC :: NMFS

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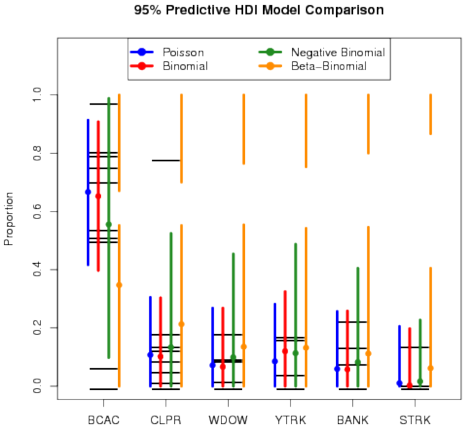
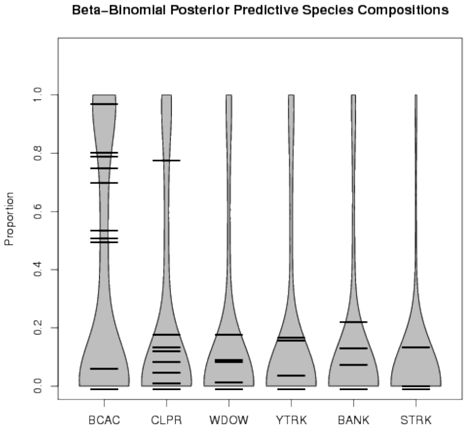
Likelihood

y_{ij}: i^{th} sample of the j^{th} species' integer weight from market category 250, in the Monterey port complex trawl fishery for the second quarter of 1982.

$$y_{ij} \sim \text{Pois}(\theta_j) \quad y_{ij} \sim \text{Bin}(\theta_j) \quad y_{ij} \sim \text{NB}(\theta_j, \phi) \quad y_{ij} \sim \text{BB}(\theta_j, \phi)$$


95% Predictive HDI Model Comparison
Poisson
Binomial
Negative Binomial
Beta–Binomial
Proportion
0.0
0.2
0.4
0.6
0.8
1.0
BCAC
CLPR
WDOW
YTRK
BANK
STRK


Beta–Binomial Posterior Predictive Species Compositions
Proportion
0.0
0.2
0.4
0.6
0.8
1.0
BCAC
CLPR
WDOW
YTRK
BANK
STRK

	Poisson	Binomial	NB	BB
MSE	0.06412	0.06264	0.05171	0.04479
Δ DIC	1001.41	1230.60	5.03	0
Δ WAIC	1079.95	1323.75	3.43	0
$pr(M\|y)$	≈ 0	≈ 0	$\approx 10^{-7}$	≈ 1

Beta-Binomial Model

$$y_{ijklm\eta} \sim \text{Beta-Binomial}\Big(\mu_{jklm\eta},\ \sigma^2_{jklm\eta}\Big)$$

$$\mu_{jklm\eta} = n\ \text{logit}^{-1}(\theta_{jklm\eta})$$

$$\sigma^2_{jklm\eta} = \mu_{jklm\eta}\left(1 - \frac{\mu_{jklm\eta}}{n}\right)\Big(1 + (n-1)\ \rho\Big)$$

$$\theta_{jklm\eta} = \beta_0 + \beta^{(s)}_j + \beta^{(p)}_k + \beta^{(g)}_l + \beta^{(t)}_{m\eta}$$

$y_{ijklm\eta}$: i^{th} sample of the j^{th} species' integer weight, in the k^{th} port, caught with the l^{th} gear, in the η^{th} quarter, of year m, for a particular market category.

$$\begin{array}{lll} j & \in & \{1, ..., J\}\ \text{Species} \\ k & \in & \{1, ..., K\}\ \text{Ports} \\ l & \in & \{1, ..., L\}\ \text{Gears} \\ m & \in & \{1, ..., M\}\ \text{Years} \\ \eta & \in & \{1, ..., H\}\ \text{Quarters} \end{array}$$

Time Model

(M1)

$$\beta^{(t)}_{m\eta} = \beta^{(y)}_{m} + \beta^{(q)}_{\eta}$$
$$\beta^{(y)}_{m} \sim N(0, 32^2)$$
$$\beta^{(q)}_{\eta} \sim N(0, 32^2)$$

(M2)

$$\beta^{(t)}_{m\eta} = \beta^{(y)}_{m} + \beta^{(q)}_{\eta}$$
$$\beta^{(y)}_{m} \sim N(0, v^{(y)})$$
$$\beta^{(q)}_{\eta} \sim N(0, v^{(q)})$$

(M3)

$$\beta^{(t)}_{m\eta} = \beta^{(y)}_{m} + \beta^{(q)}_{\eta} + \beta^{(y:q)}_{m\eta}$$
$$\beta^{(y)}_{m} \sim N(0, v^{(y)})$$
$$\beta^{(q)}_{\eta} \sim N(0, v^{(q)})$$
$$\beta^{(y:q)}_{m\eta} \sim N(0, v)$$

(M4)

$$\beta^{(t)}_{m\eta} = \beta^{(y:q)}_{m\eta}$$
$$\beta^{(y:q)}_{m\eta} \sim N(0, v)$$

(M5)

$$\beta^{(t)}_{m\eta} = \beta^{(y:q)}_{m\eta}$$
$$\beta^{(y:q)}_{m\eta} \sim N(0, v_{\eta})$$

(M6)

$$\beta^{(t)}_{m\eta} = \beta^{(y:q)}_{m\eta}$$
$$\beta^{(y:q)}_{m\eta} \sim N(0, v_{m})$$

i

1978-1982

	M1	M2	M3	M4	M5	M6
MSE	0.12725	0.12704	0.12680	0.12237	0.12724	0.12657
Δ DIC	2558.56	2259.94	2013.21	0	2175.32	2174.71
Δ WAIC	2562.65	2263.58	2009.32	0	2171.18	2170.56
$pr(M\|y)$	≈ 0	≈ 0	≈ 0	≈ 1	≈ 0	≈ 0

1983-1990*

	M1	M2	M3	M4	M5	M6
MSE	0.12724	0.12704	0.12680	0.12237	0.12723	0.12657
Δ DIC	2558.56	2259.94	2013.21	0	2175.32	2174.71
Δ WAIC	2562.65	2263.58	2009.32	0	2171.18	2170.56
$pr(M\|y)$	≈ 0	≈ 0	≈ 0	≈ 1	≈ 0	≈ 0

- 1983-1990 Results
- BMA Procedure
- BMA Results
- Prediction/?Hindcasting?
- Species Composition