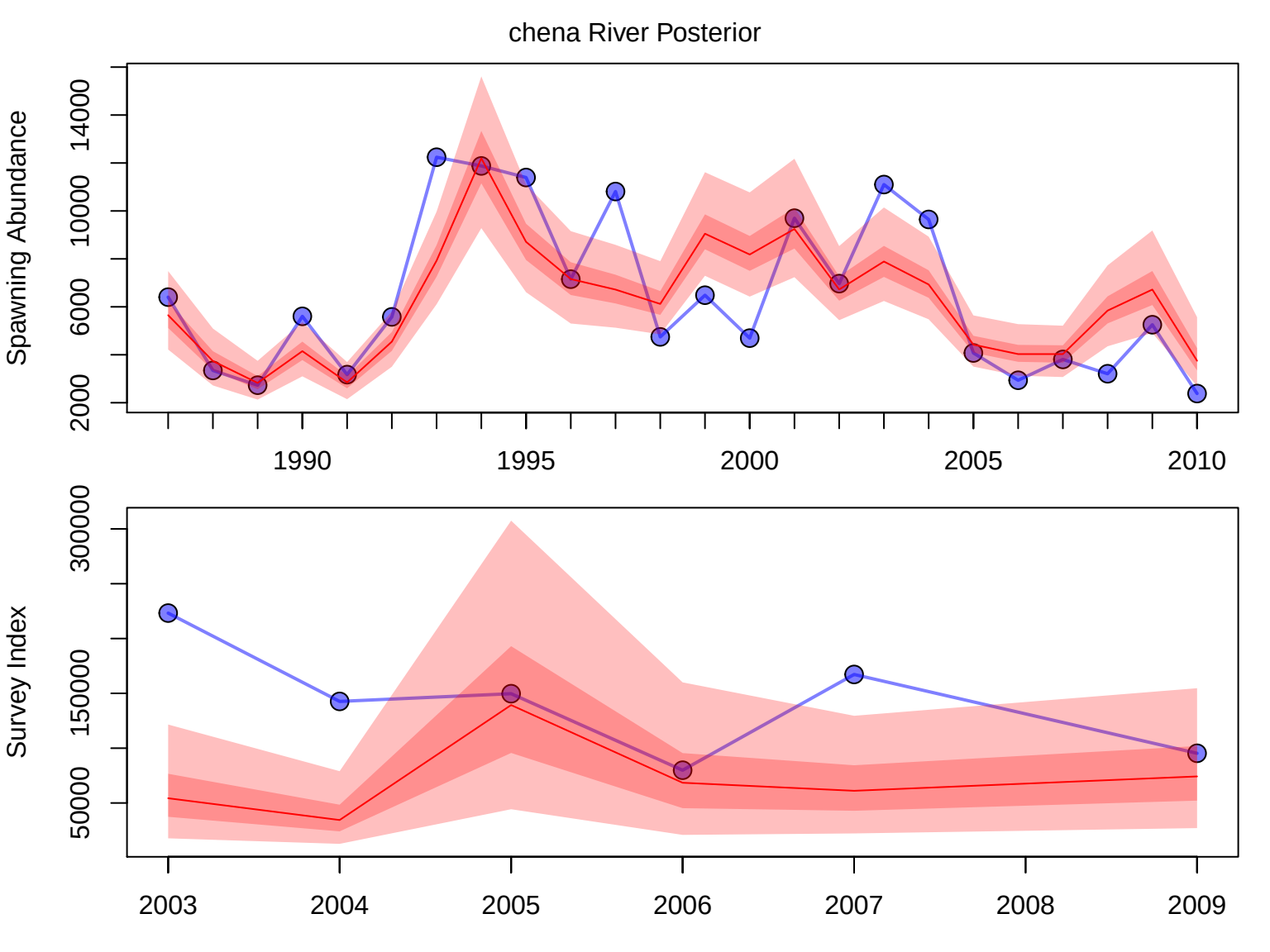
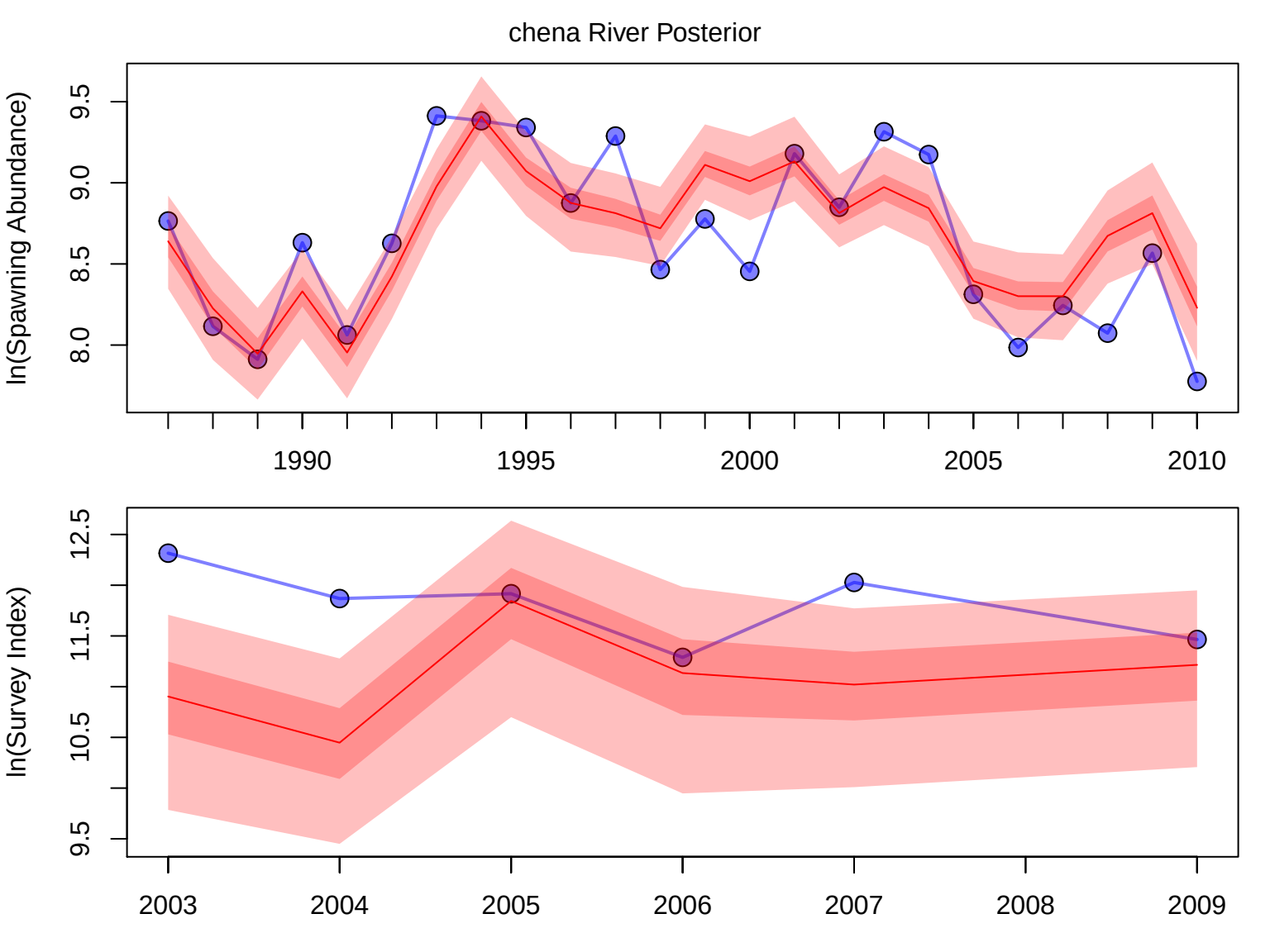
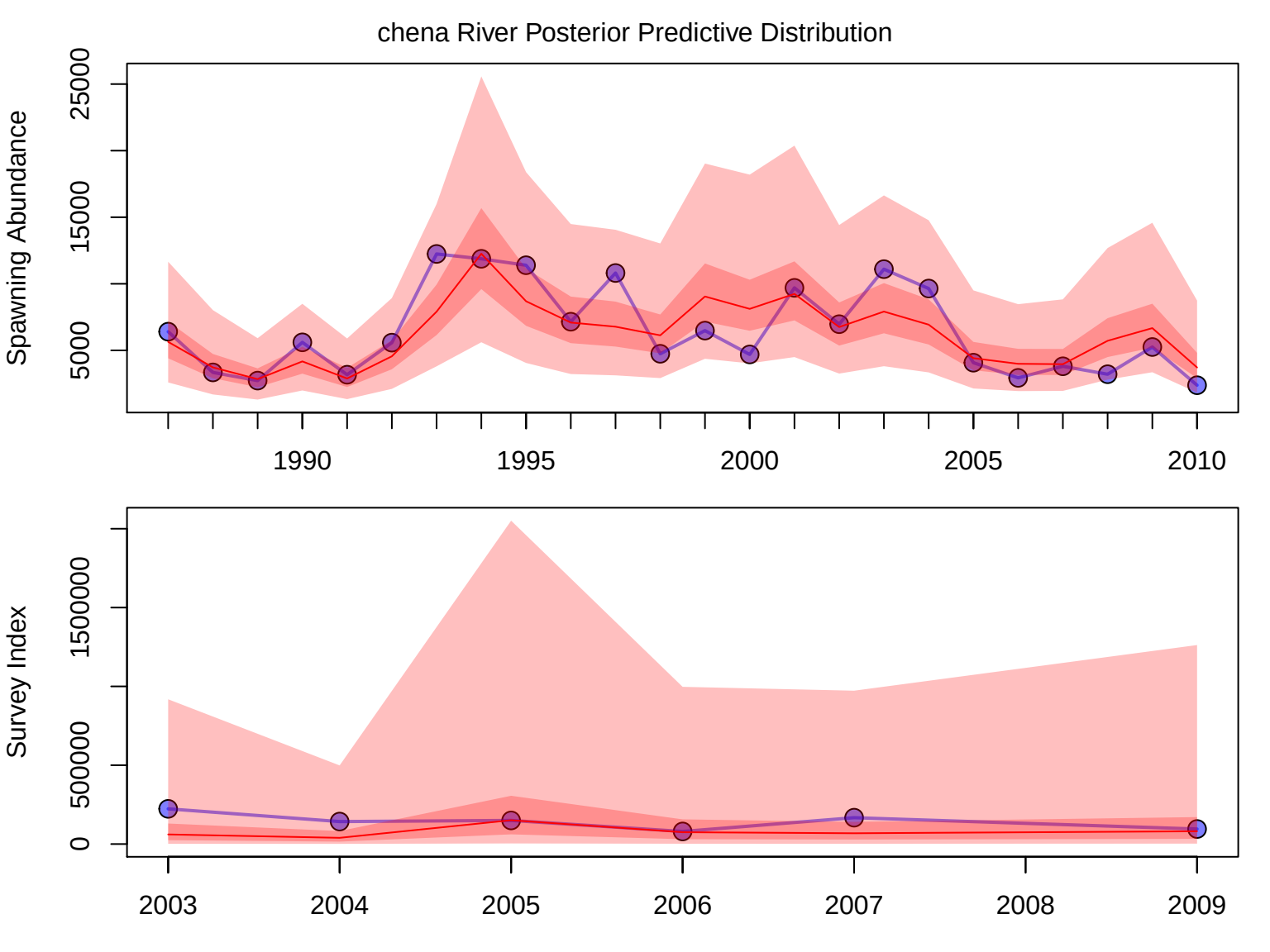
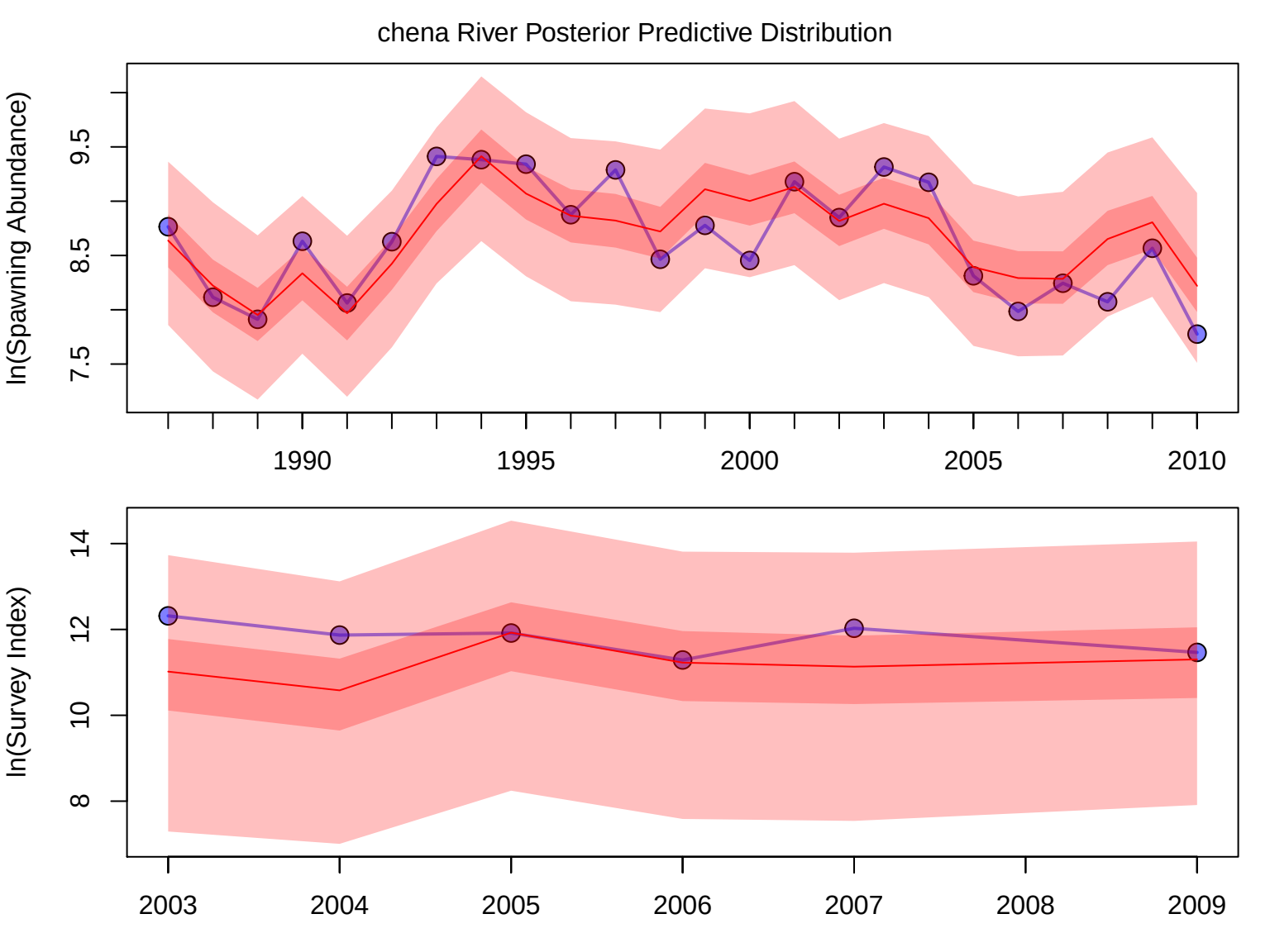
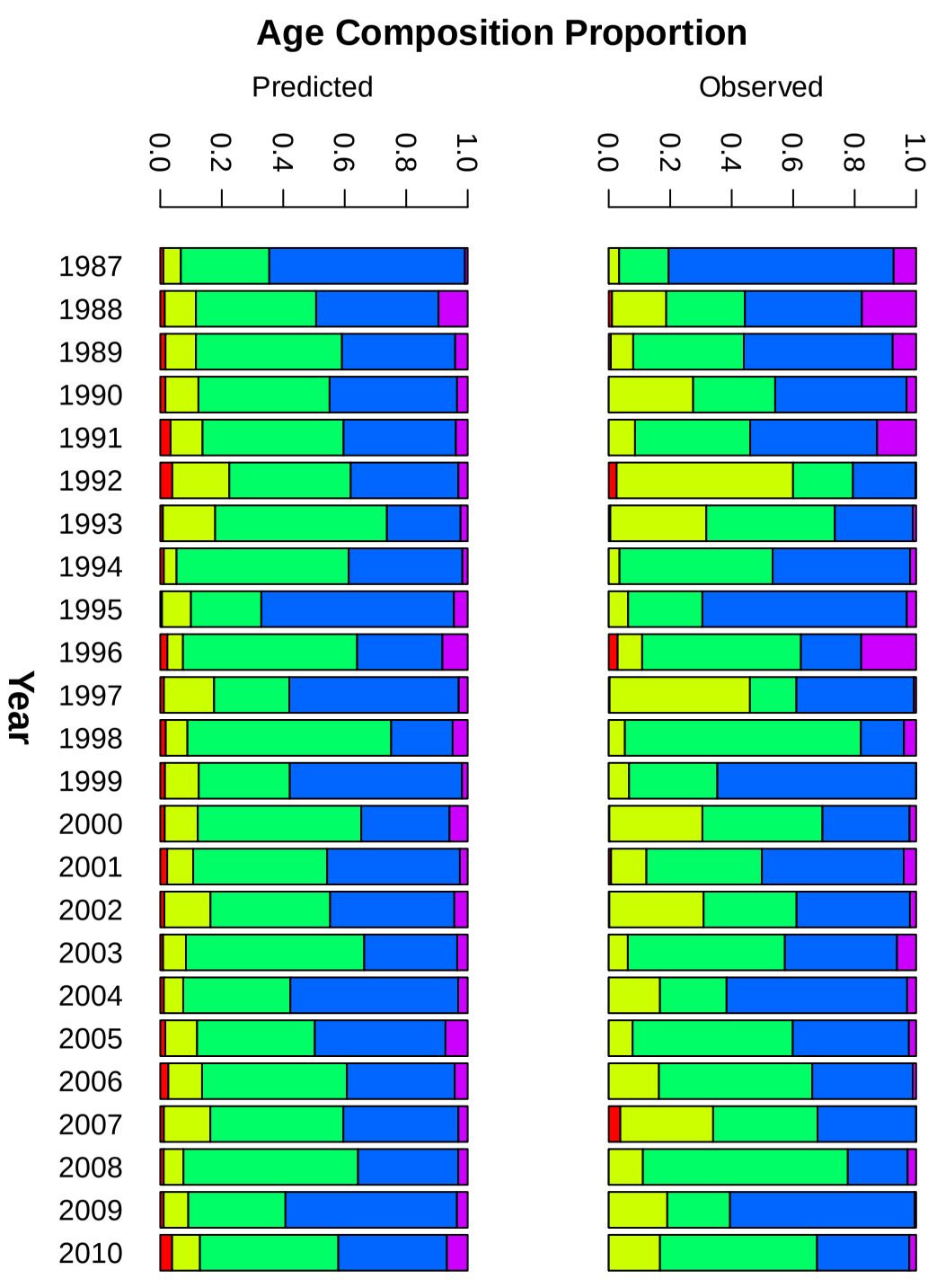
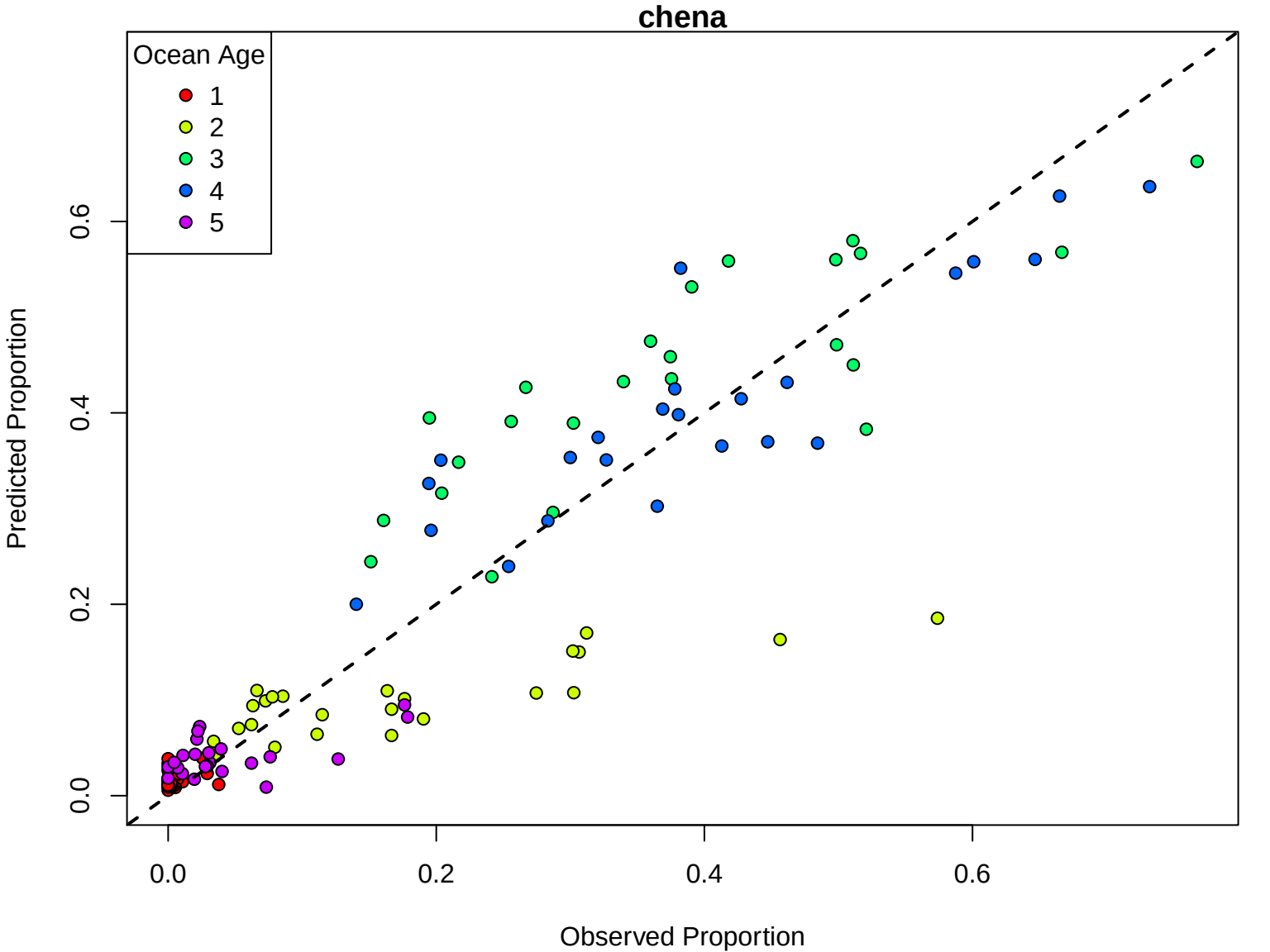

chena River Posterior
Spawning Abundance
2000
6000
10000
14000
1990
1995
2000
2005
2010
Survey Index
50000
150000
300000
2003
2004
2005
2006
2007
2008
2009

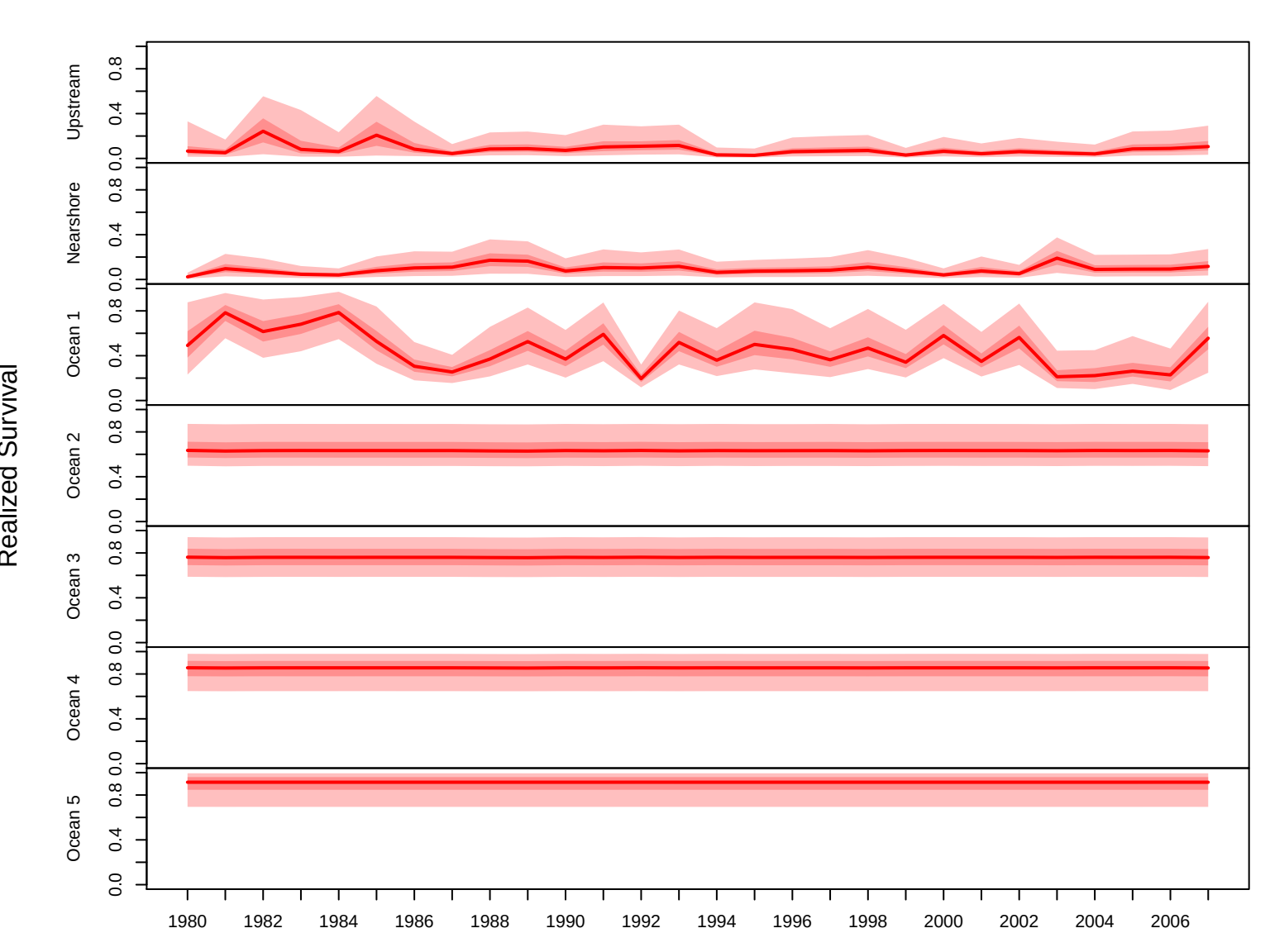

chena River Posterior
ln(Spawning Abundance)
8.0
8.5
9.0
9.5
1990
1995
2000
2005
2010
ln(Survey Index)
9.5
10.5
11.5
12.5
2003
2004
2005
2006
2007
2008
2009

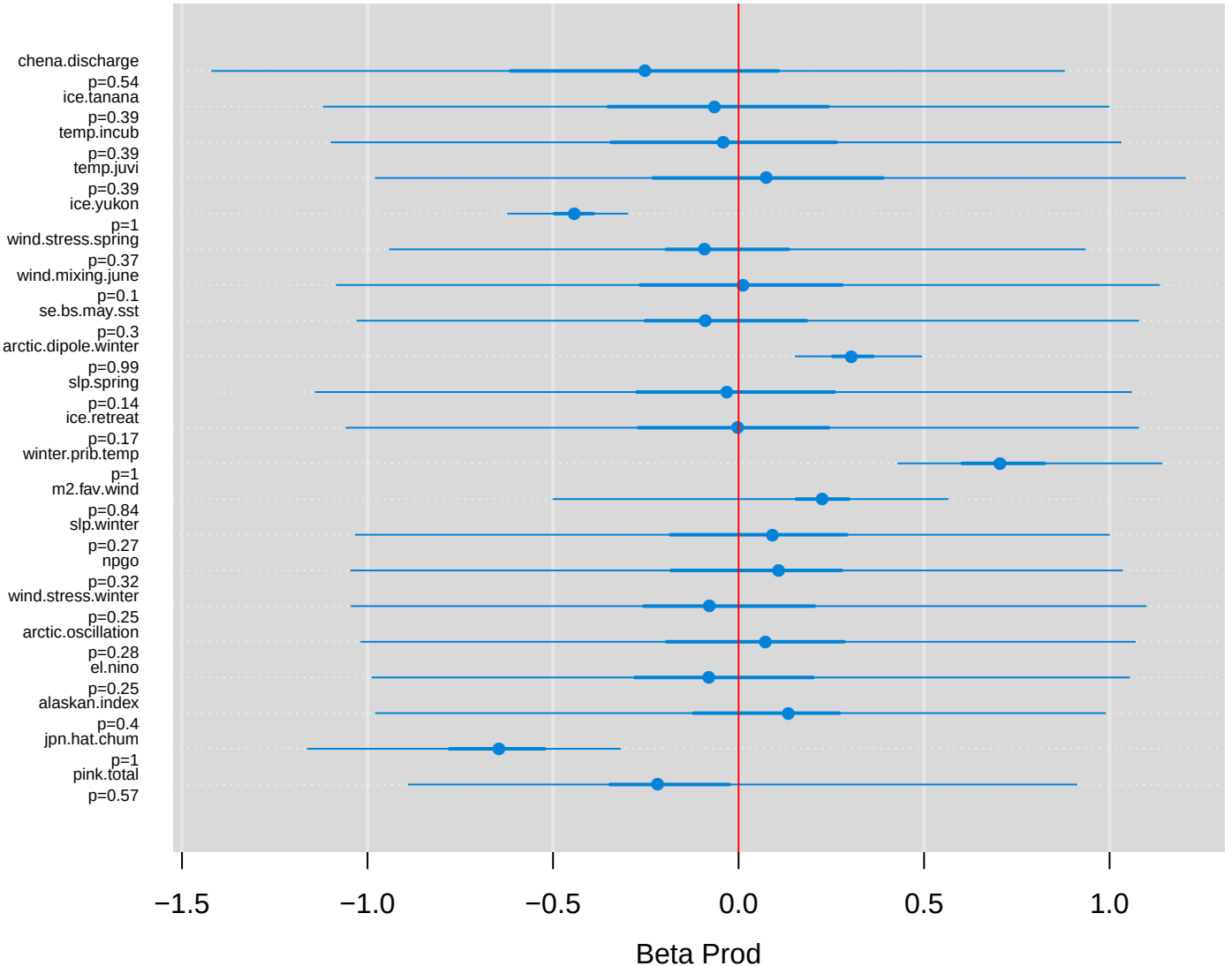

chena River Posterior Predictive Distribution
Spawning Abundance
25000
15000
5000
1990
1995
2000
2005
2010
Survey Index
1500000
500000
0
2003
2004
2005
2006
2007
2008
2009

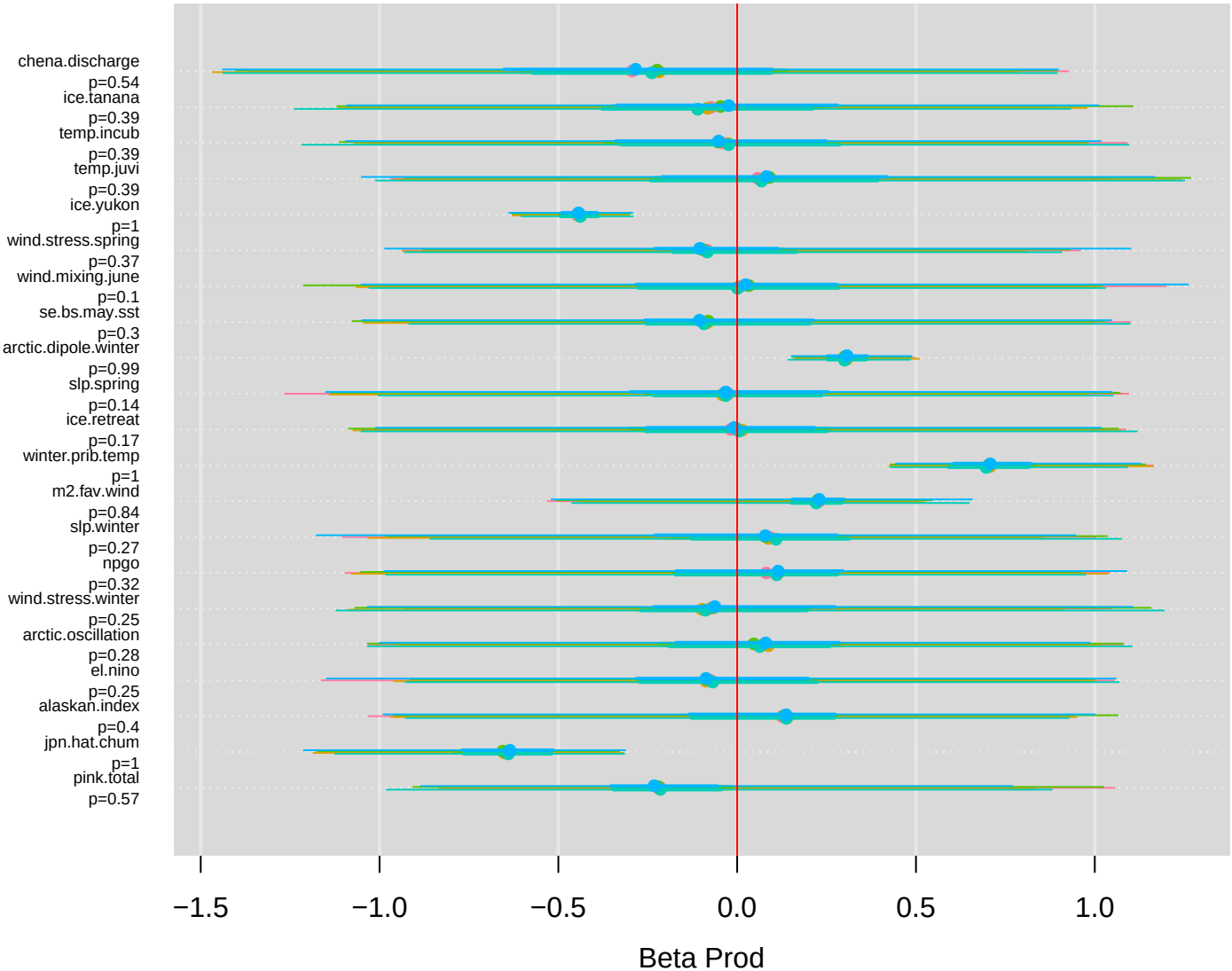

chena River Posterior Predictive Distribution
ln(Spawning Abundance)
7.5
8.5
9.5
1990
1995
2000
2005
2010
ln(Survey Index)
8
10
12
14
2003
2004
2005
2006
2007
2008
2009

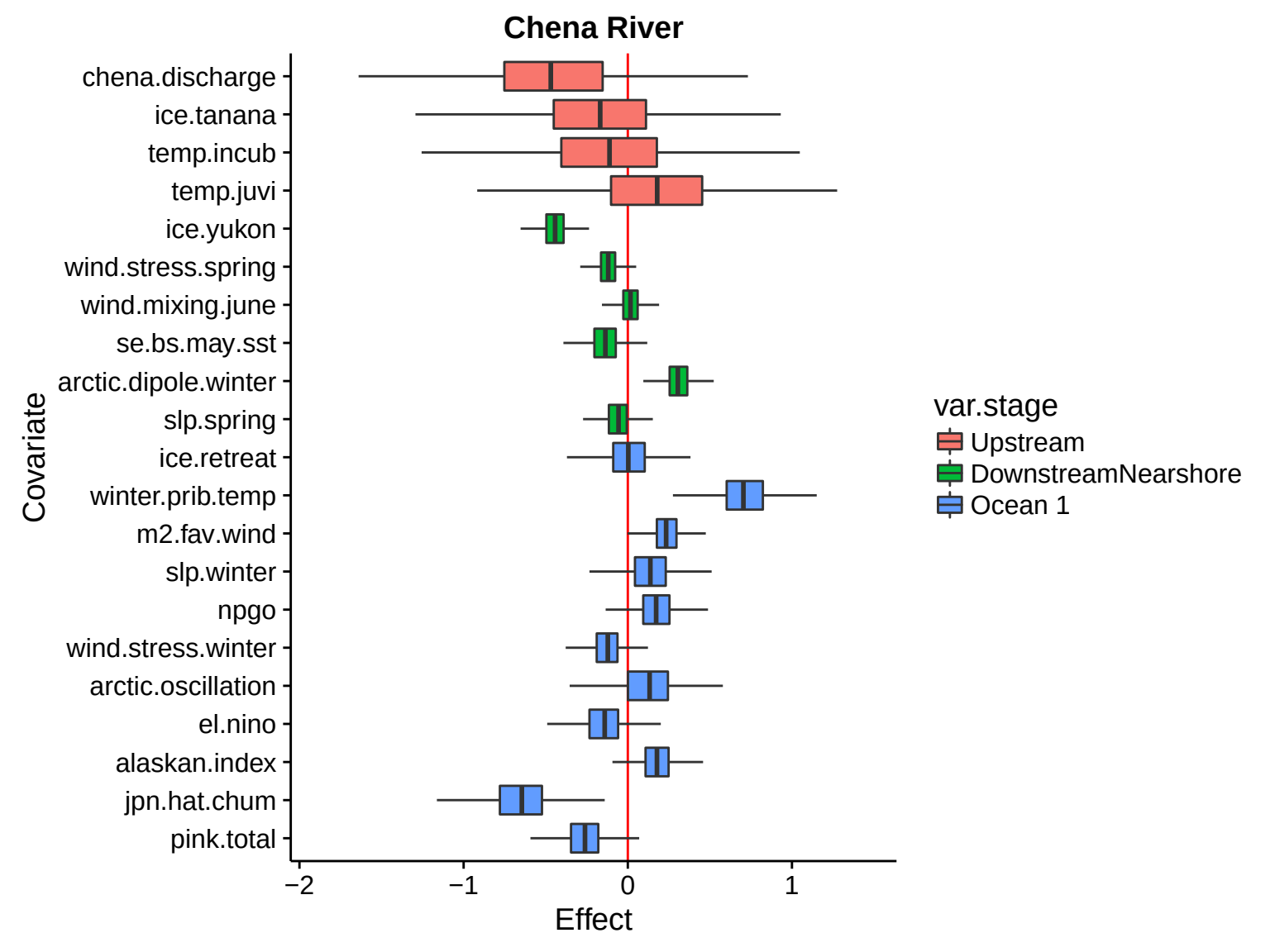

Age Composition Proportion
Predicted
Observed
0.0
0.2
0.4
0.6
0.8
1.0
Year
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010

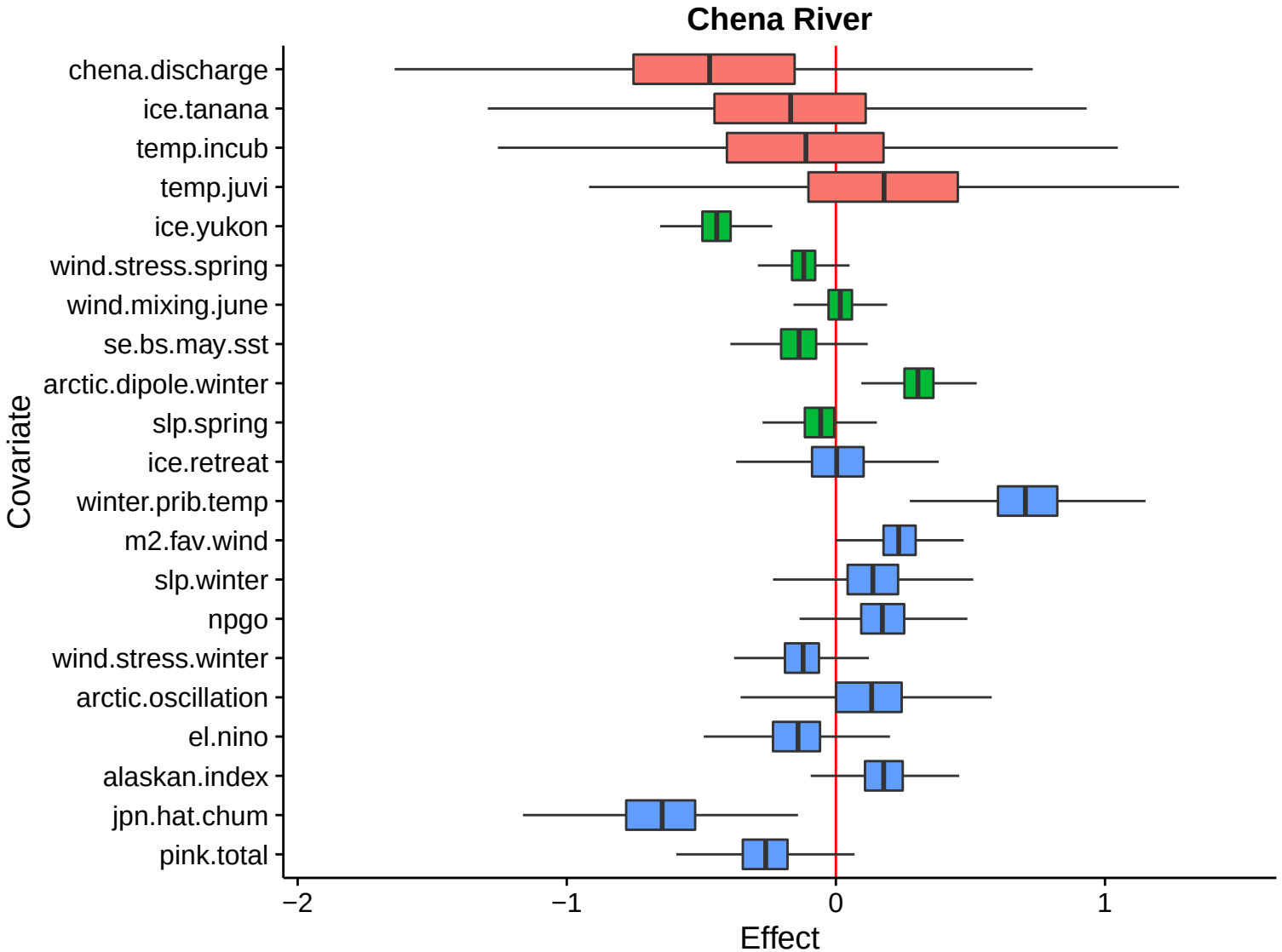

chena
Ocean Age
1
2
3
4
5
Predicted Proportion
0.0
0.2
0.4
0.6
Observed Proportion
0.0
0.2
0.4
0.6

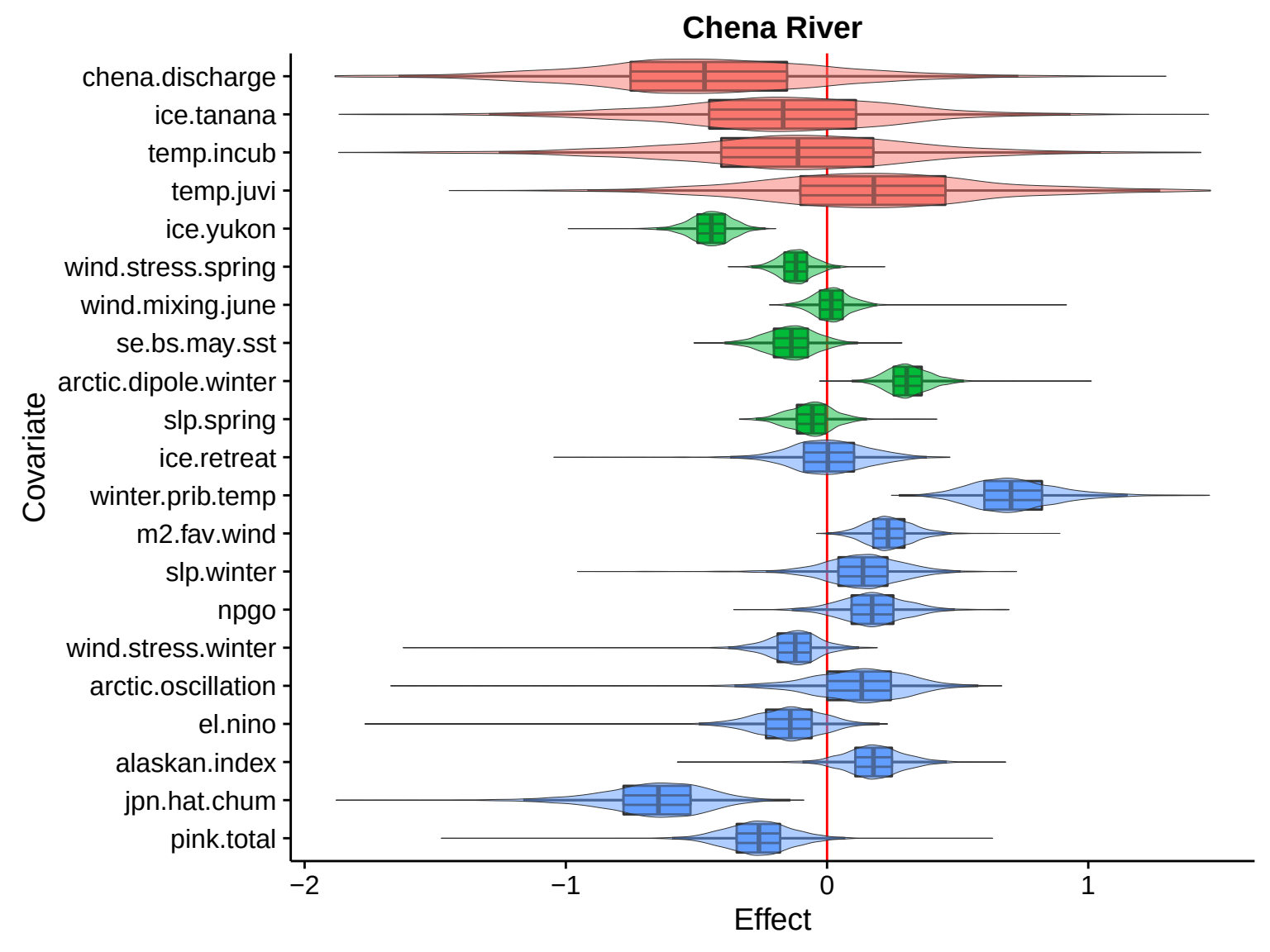

Realized Survival
Upstream
Nearshore
Ocean 1
Ocean 2
Ocean 3
Ocean 4
Ocean 5
0.0
0.4
0.8
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006

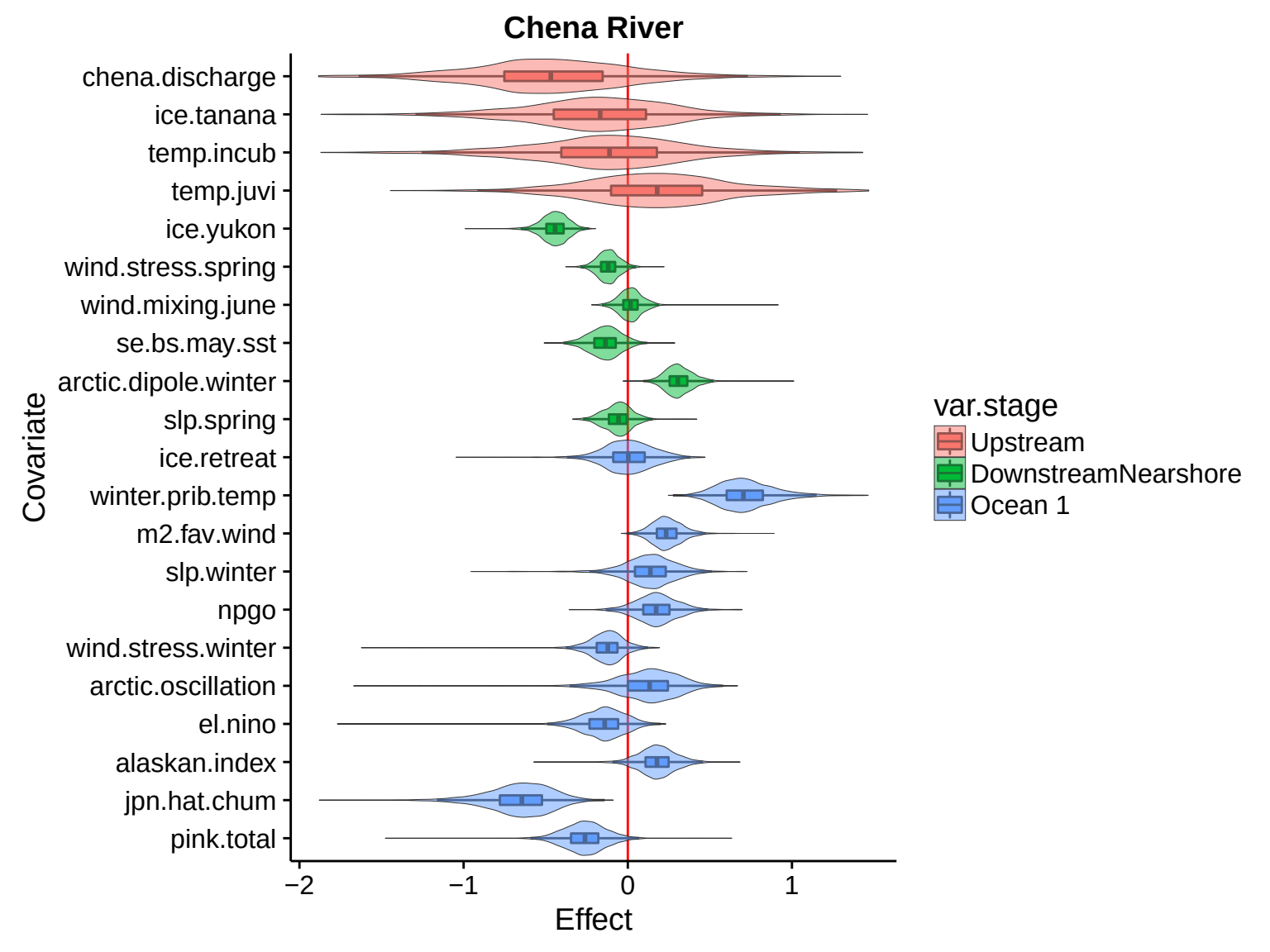

chena.discharge
p=0.54
ice.tanana
p=0.39
temp.incub
p=0.39
temp.juvi
p=0.39
ice.yukon
p=1
wind.stress.spring
p=0.37
wind.mixing.june
p=0.1
se.bs.may.sst
p=0.3
arctic.dipole.winter
p=0.99
slp.spring
p=0.14
ice.retreat
p=0.17
winter.prib.temp
p=1
m2.fav.wind
p=0.84
slp.winter
p=0.27
npgo
p=0.32
wind.stress.winter
p=0.25
arctic.oscillation
p=0.28
el.nino
p=0.25
alaskan.index
p=0.4
jpn.hat.chum
p=1
pink.total
p=0.57
−1.5
−1.0
−0.5
0.0
0.5
1.0
Beta Prod

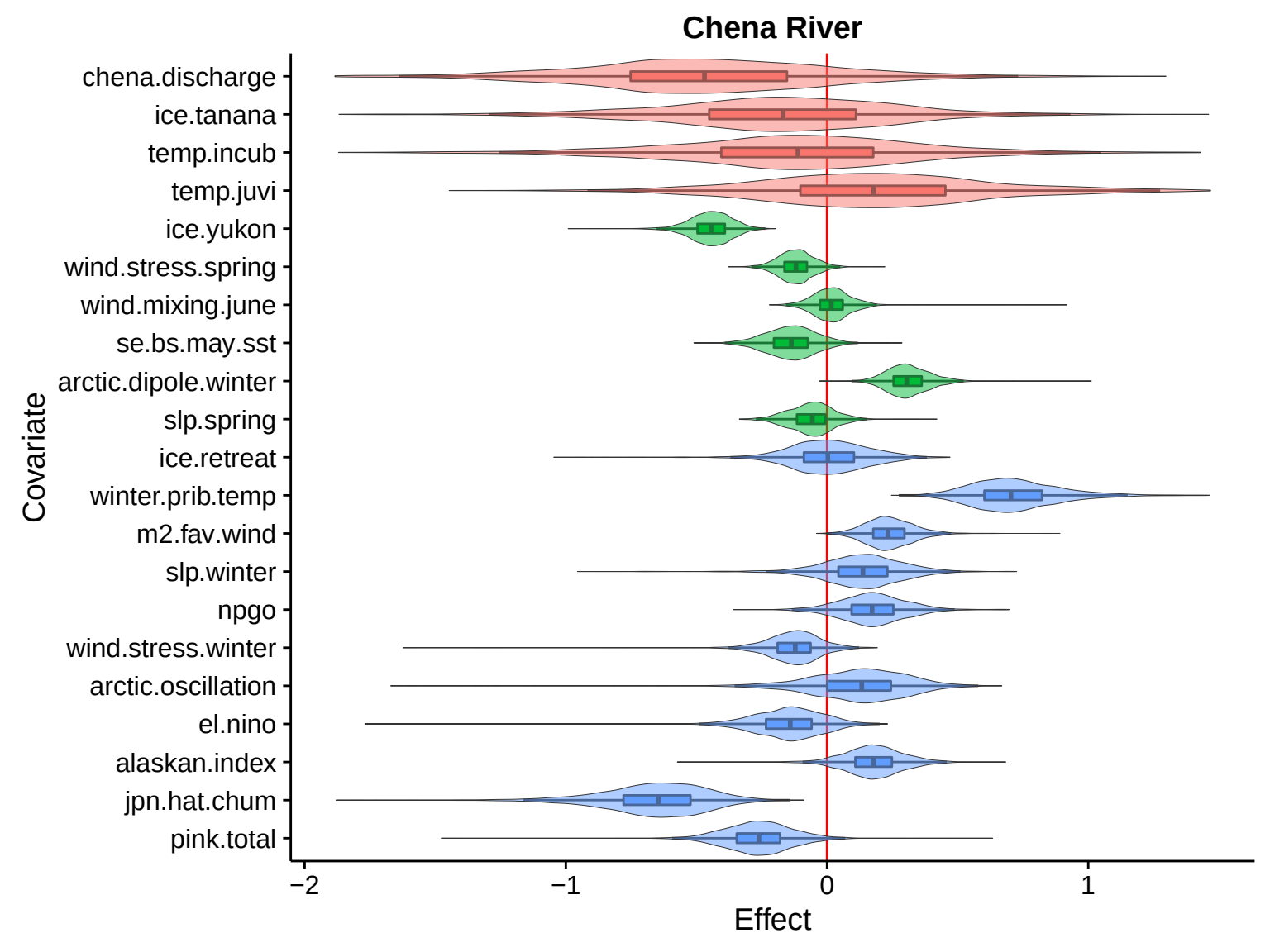

chena.discharge
p=0.54
ice.tanana
p=0.39
temp.incub
p=0.39
temp.juvi
p=0.39
ice.yukon
p=1
wind.stress.spring
p=0.37
wind.mixing.june
p=0.1
se.bs.may.sst
p=0.3
arctic.dipole.winter
p=0.99
slp.spring
p=0.14
ice.retreat
p=0.17
winter.prib.temp
p=1
m2.fav.wind
p=0.84
slp.winter
p=0.27
npgo
p=0.32
wind.stress.winter
p=0.25
arctic.oscillation
p=0.28
el.nino
p=0.25
alaskan.index
p=0.4
jpn.hat.chum
p=1
pink.total
p=0.57
−1.5
−1.0
−0.5
0.0
0.5
1.0
Beta Prod

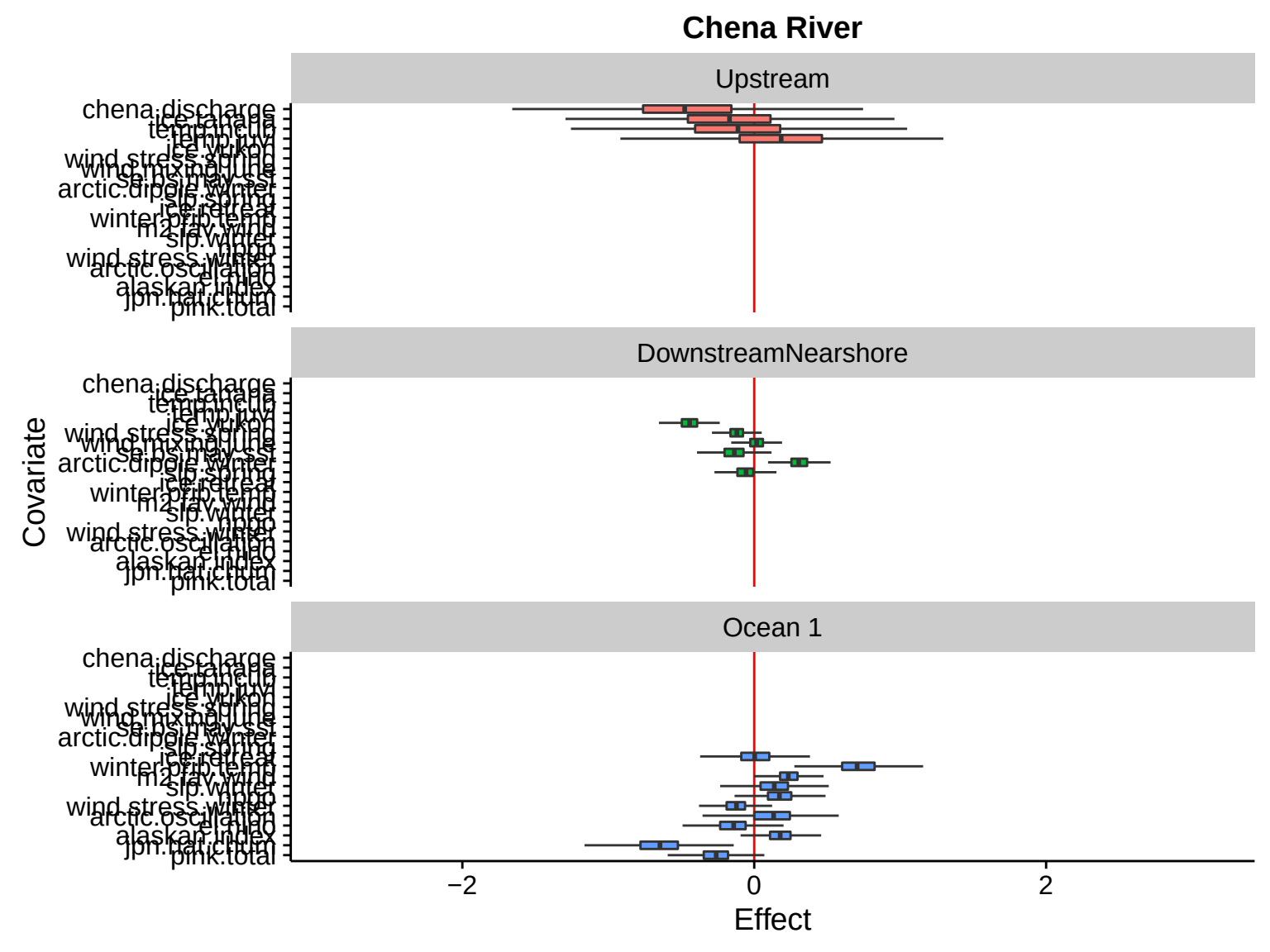

Chena River
chena.discharge
ice.tanana
temp.incub
temp.juvi
ice.yukon
wind.stress.spring
wind.mixing.june
se.bs.may.sst
arctic.dipole.winter
slp.spring
ice.retreat
winter.prib.temp
m2.fav.wind
slp.winter
npgo
wind.stress.winter
arctic.oscillation
el.nino
alaskan.index
jpn.hat.chum
pink.total
Covariate
−2
−1
0
1
Effect
var.stage
Upstream
DownstreamNearshore
Ocean 1


Chena River
chena.discharge
ice.tanana
temp.incub
temp.juvi
ice.yukon
wind.stress.spring
wind.mixing.june
se.bs.may.sst
arctic.dipole.winter
slp.spring
ice.retreat
winter.prib.temp
m2.fav.wind
slp.winter
npgo
wind.stress.winter
arctic.oscillation
el.nino
alaskan.index
jpn.hat.chum
pink.total
Covariate
−2
−1
0
1
Effect

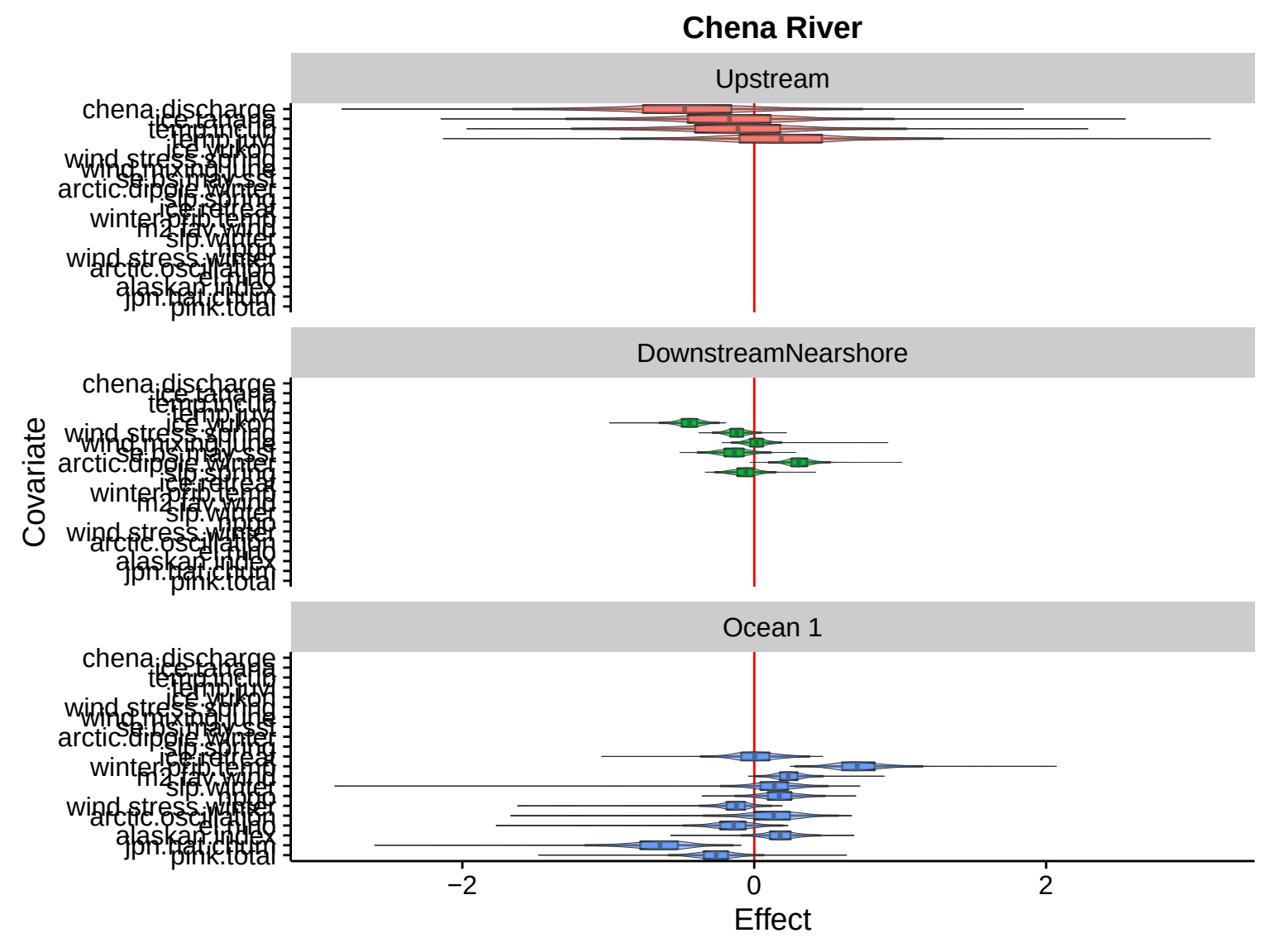

Chena River
chena.discharge
ice.tanana
temp.incub
temp.juvi
ice.yukon
wind.stress.spring
wind.mixing.june
se.bs.may.sst
arctic.dipole.winter
slp.spring
ice.retreat
winter.prib.temp
m2.fav.wind
slp.winter
npgo
wind.stress.winter
arctic.oscillation
el.nino
alaskan.index
jpn.hat.chum
pink.total
Covariate
−2
−1
0
1
Effect


Chena River
chena.discharge
ice.tanana
temp.incub
temp.juvi
ice.yukon
wind.stress.spring
wind.mixing.june
se.bs.may.sst
arctic.dipole.winter
slp.spring
ice.retreat
winter.prib.temp
m2.fav.wind
slp.winter
npgo
wind.stress.winter
arctic.oscillation
el.nino
alaskan.index
jpn.hat.chum
pink.total
Covariate
−2
−1
0
1
Effect
var.stage
Upstream
DownstreamNearshore
Ocean 1

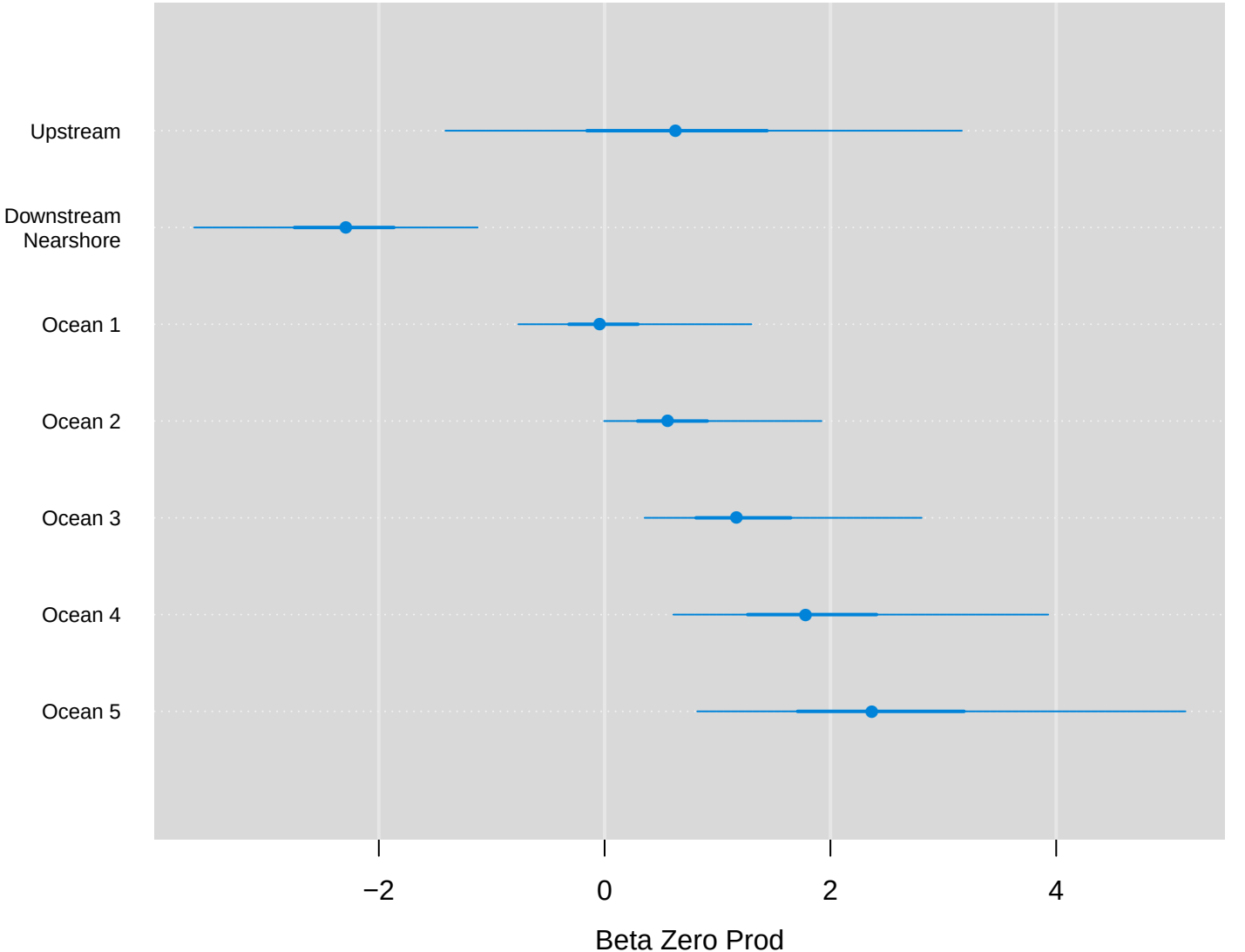

Chena River
chena.discharge
ice.tanana
temp.incub
temp.juvi
ice.yukon
wind.stress.spring
wind.mixing.june
se.bs.may.sst
arctic.dipole.winter
slp.spring
ice.retreat
winter.prib.temp
m2.fav.wind
slp.winter
npgo
wind.stress.winter
arctic.oscillation
el.nino
alaskan.index
jpn.hat.chum
pink.total
Covariate
−2
−1
0
1
Effect

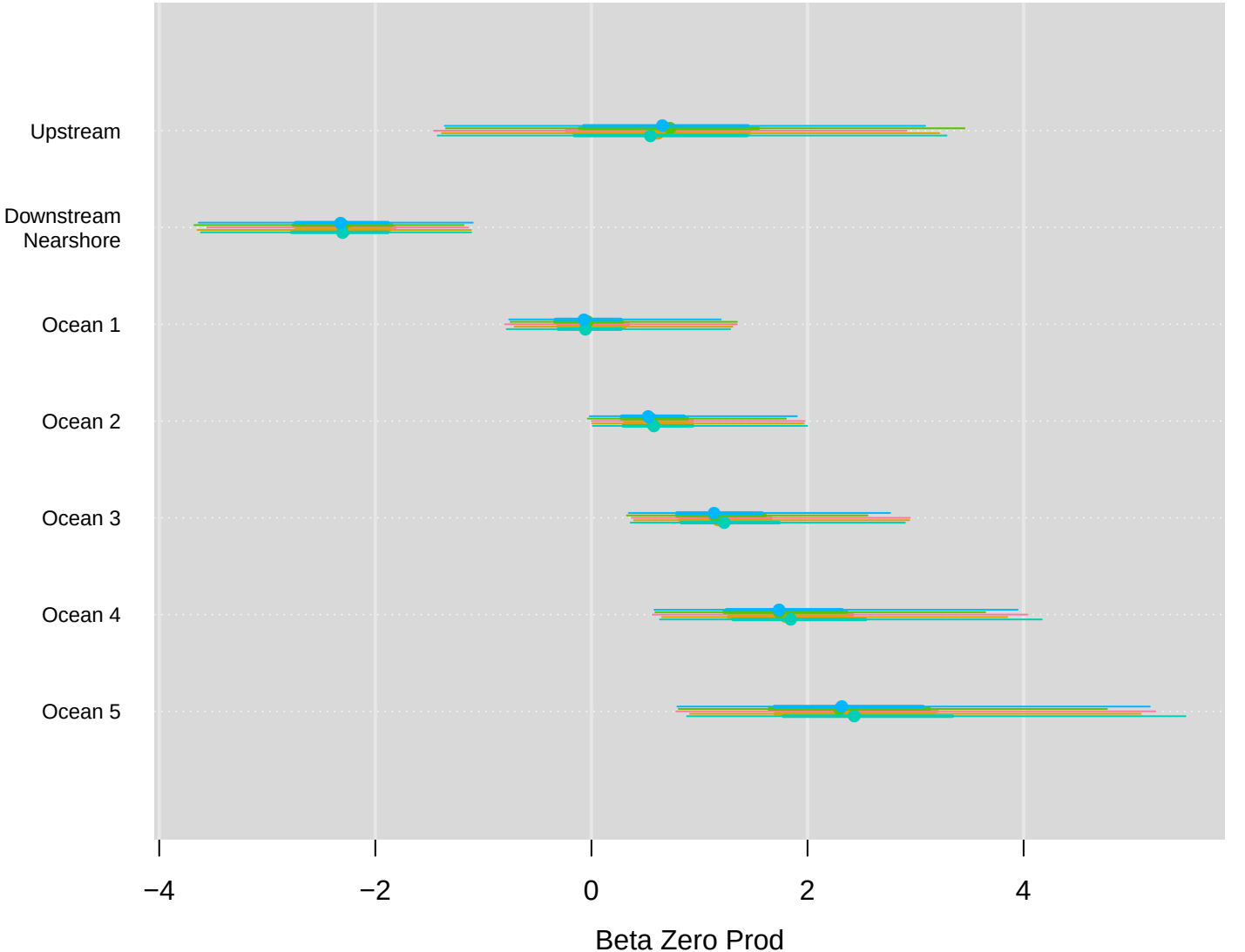


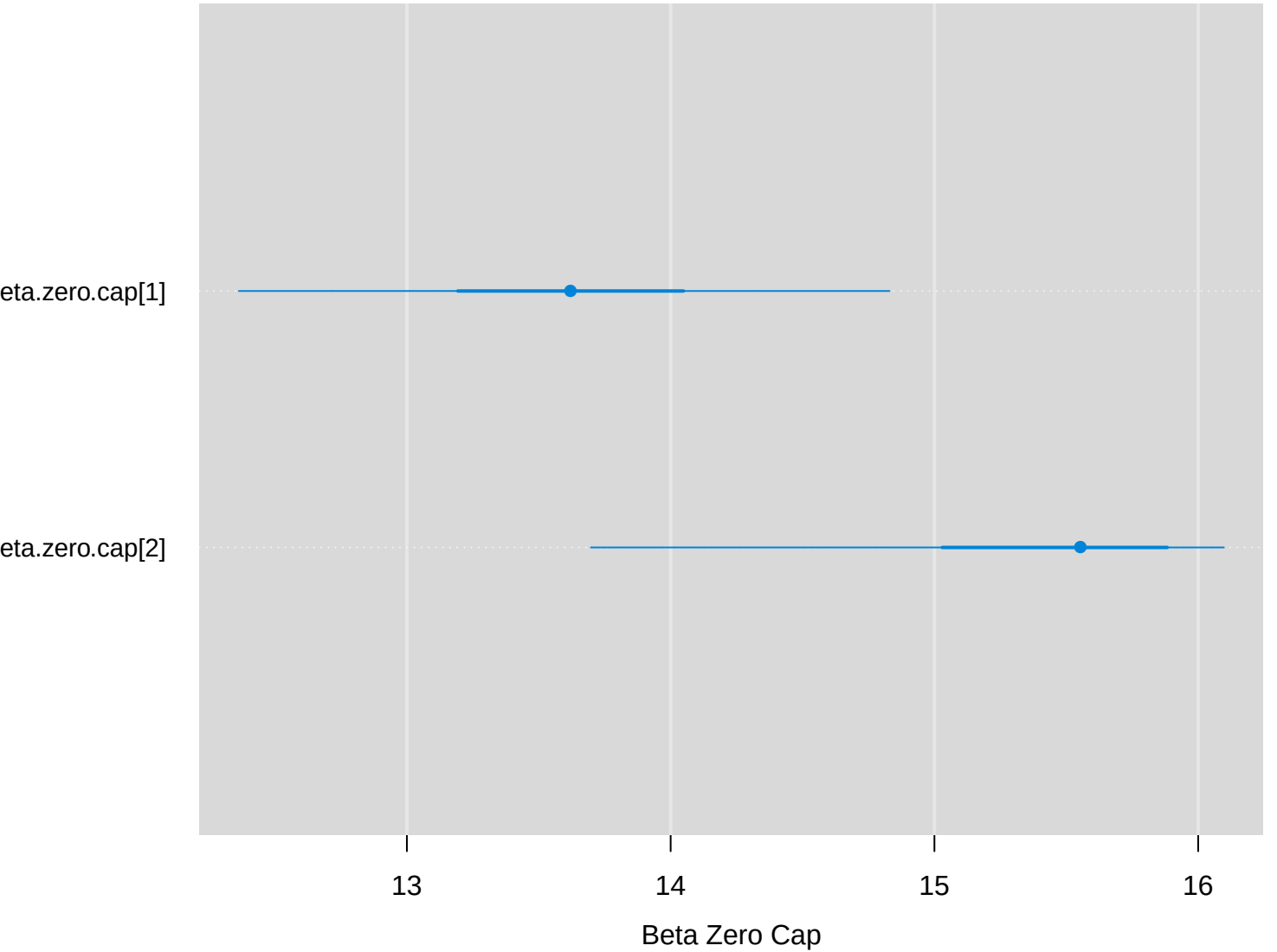
Chena River
Upstream
DownstreamNearshore
Ocean 1
chena.discharge
ice.tanana
temp.inclu
temp.juv
ice.yukon
wind.stress.spring
wind.mixing.juve
se.pol.may.sst
arctic.dipole.winter
ice.retreat
winter.prib.temp
m2.fav.wind
slp.winter
wind.stress.winter
arctic.oscillation
alaskan.index
jpn.hatichum
pink.total
Covariate
−2
0
2
Effect

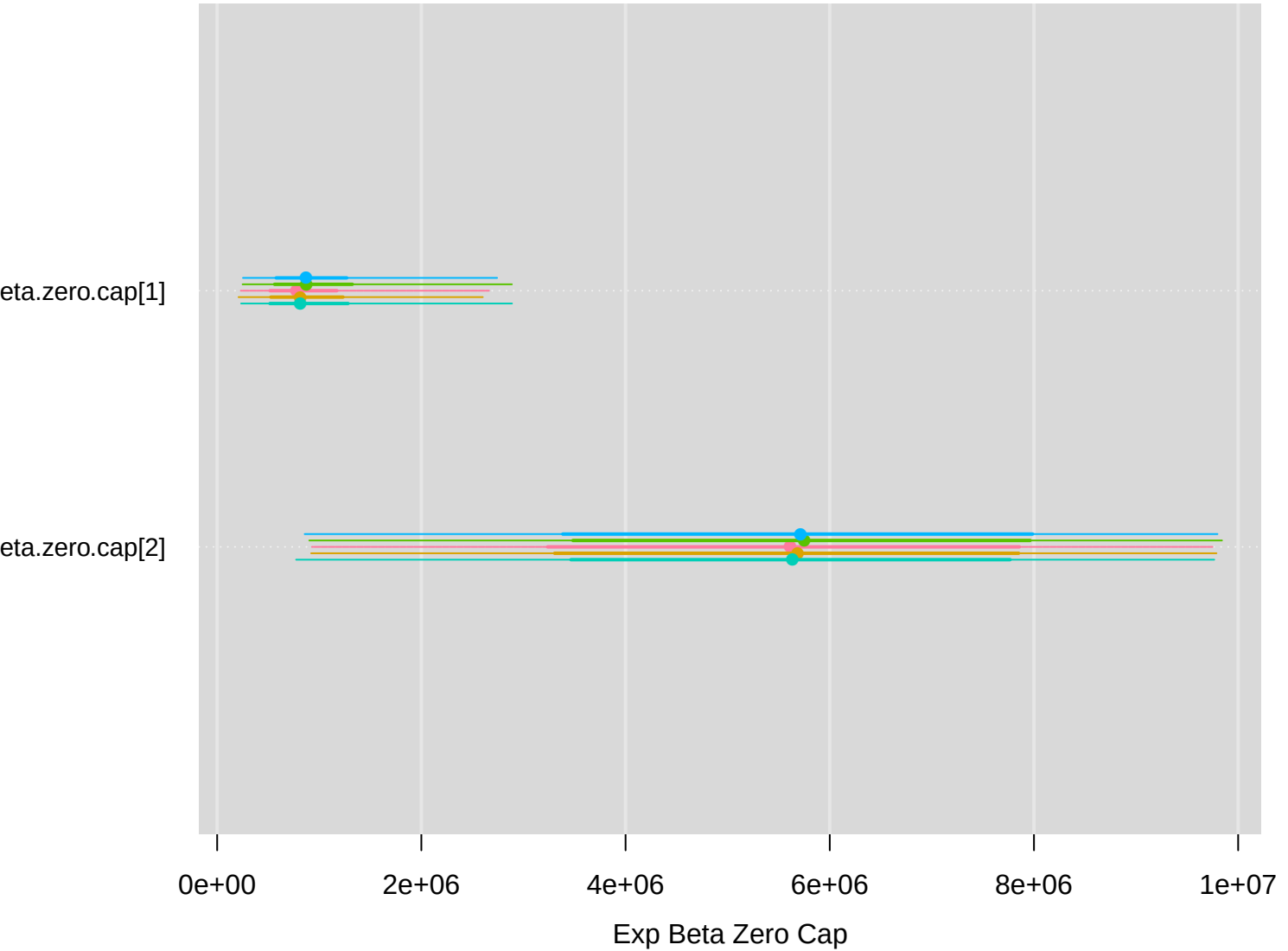


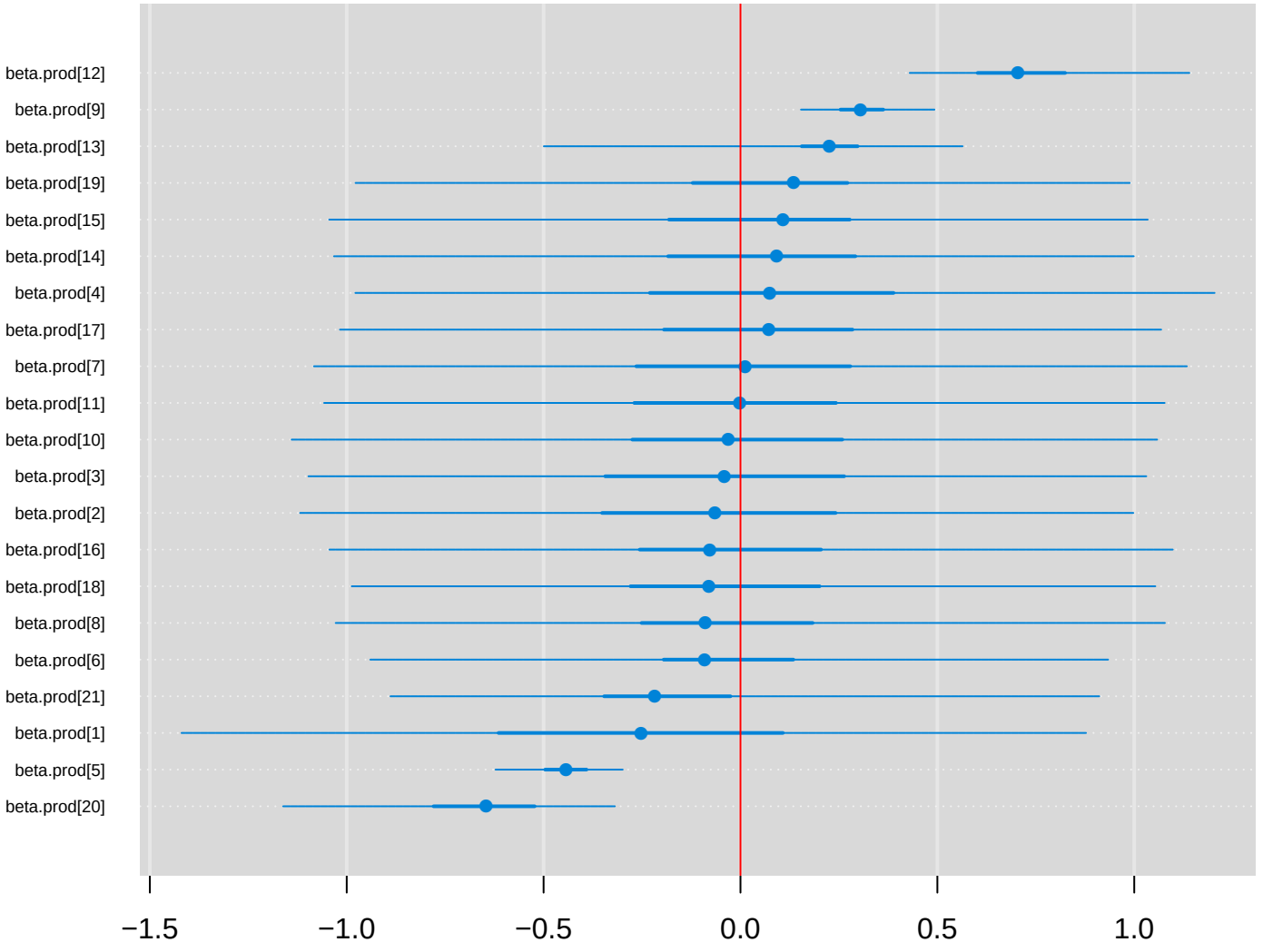
Chena River
Upstream
DownstreamNearshore
Ocean 1
chena.discharge
ice.tanana
temp.incub
temp.juv
ice.yukon
wind.stress.spring
wind.mixing.June
se.psi.may.sst
arctic.dipole.winter
slp.spring
ice.retreat
winter.prib.temp
m2.fav.wind
slp.winter
wind.stress.winter
arctic.oscillation
alaskan.index
jpn.hatichum
pink.total
Covariate
−2
0
2
Effect

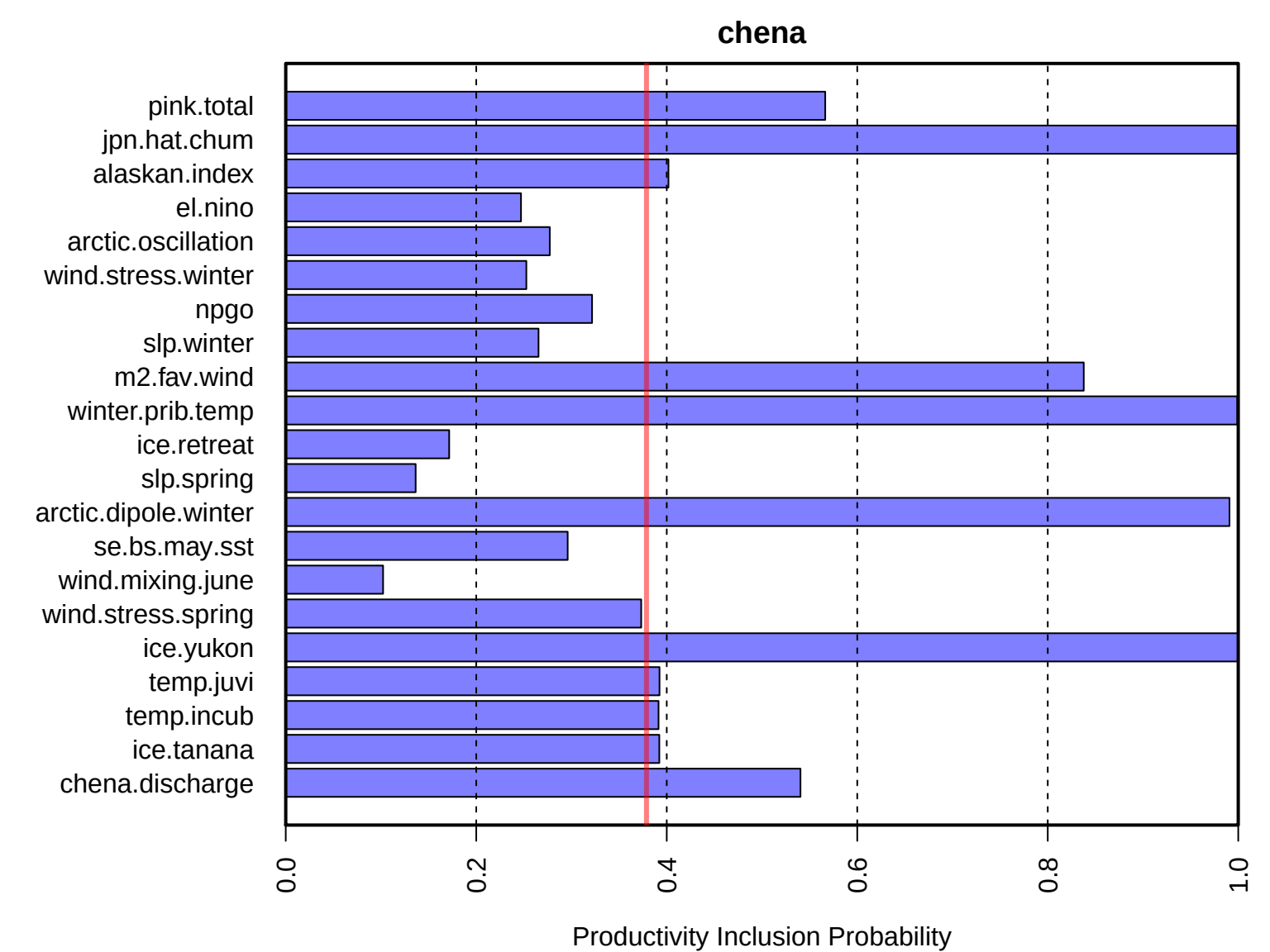

Upstream
Downstream
Nearshore
Ocean 1
Ocean 2
Ocean 3
Ocean 4
Ocean 5
−2
0
2
4
Beta Zero Prod

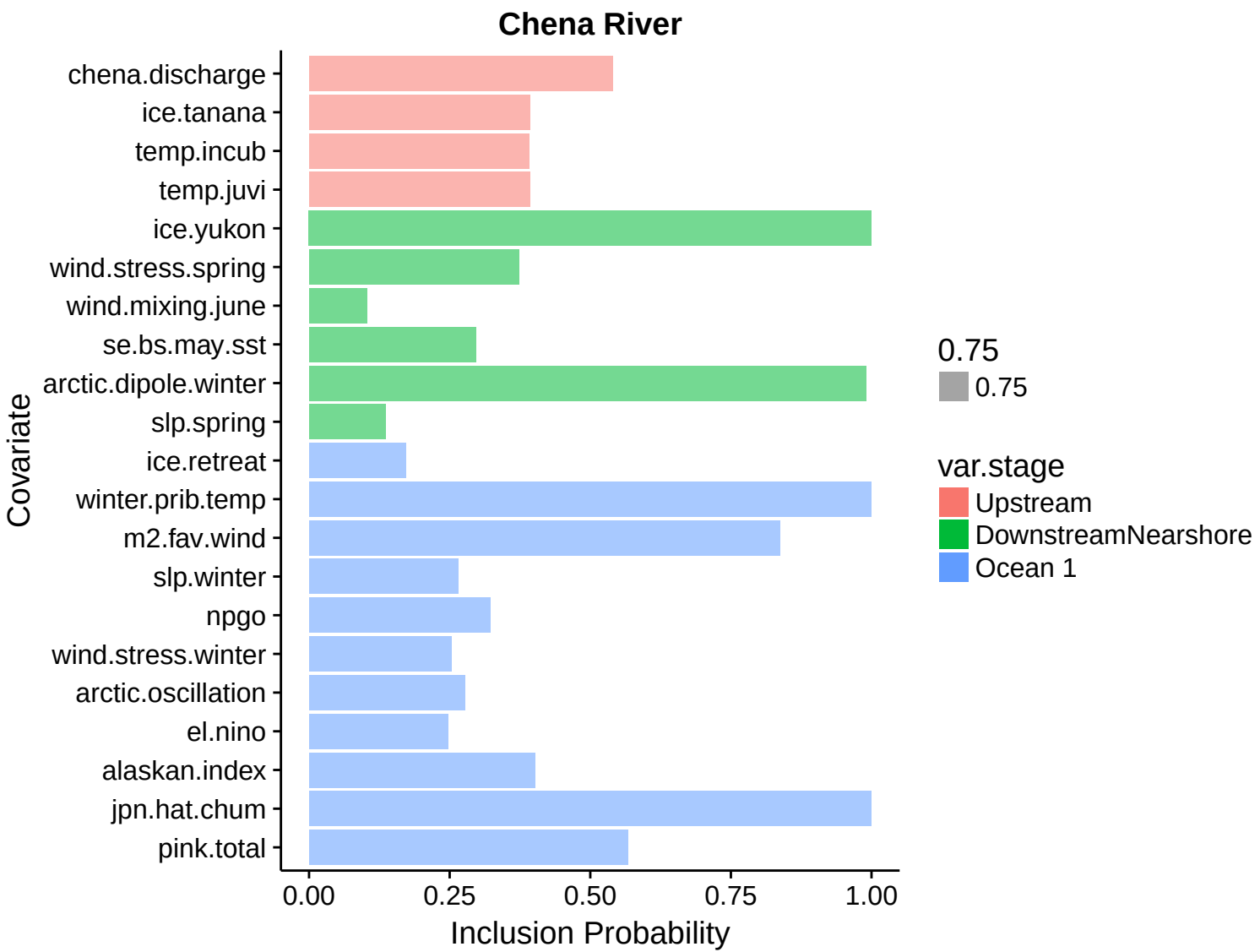

Upstream
Downstream
Nearshore
Ocean 1
Ocean 2
Ocean 3
Ocean 4
Ocean 5
−4
−2
0
2
4
Beta Zero Prod

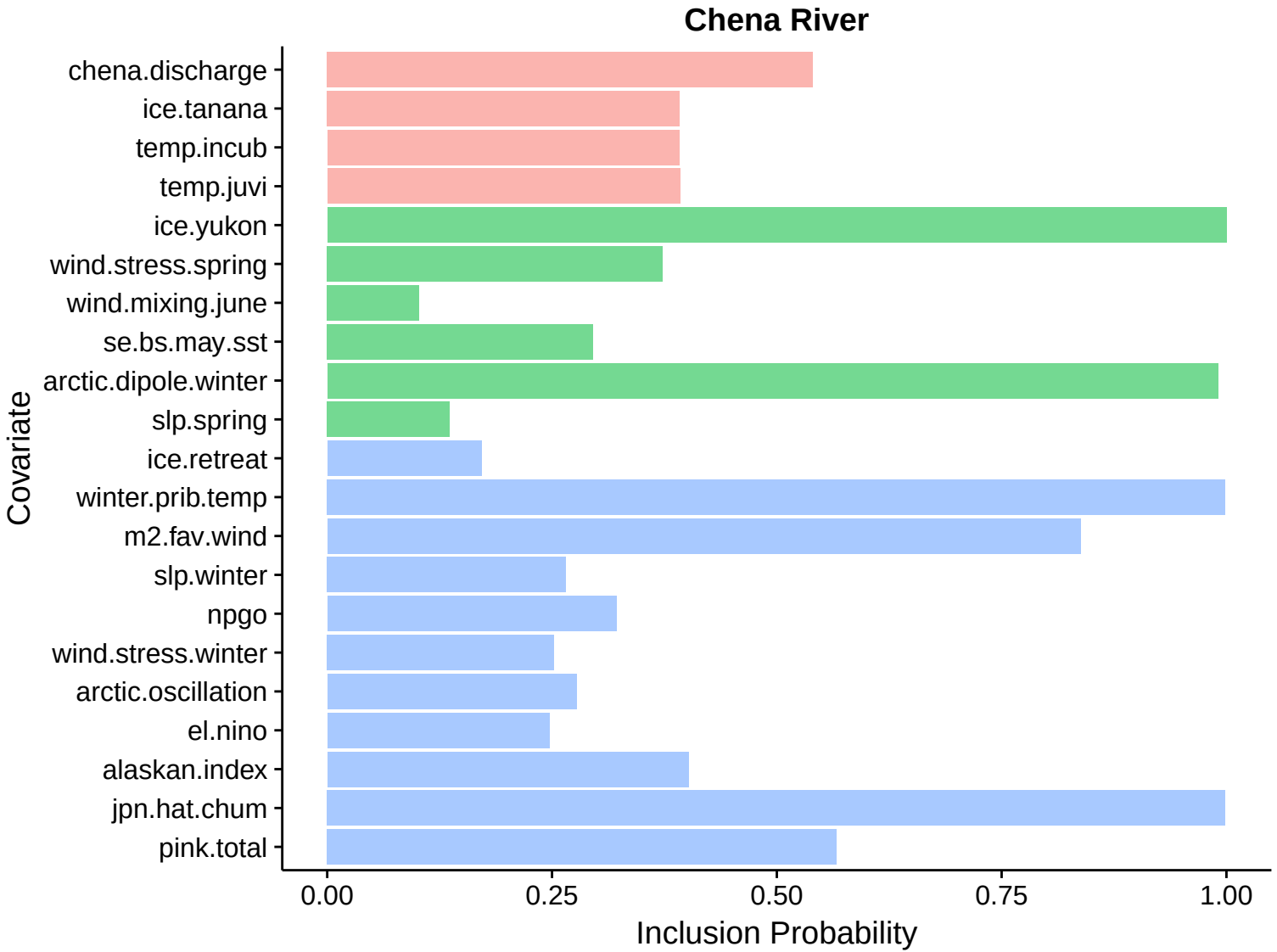

eta.zero.cap[1]
eta.zero.cap[2]
13
14
15
16
Beta Zero Cap

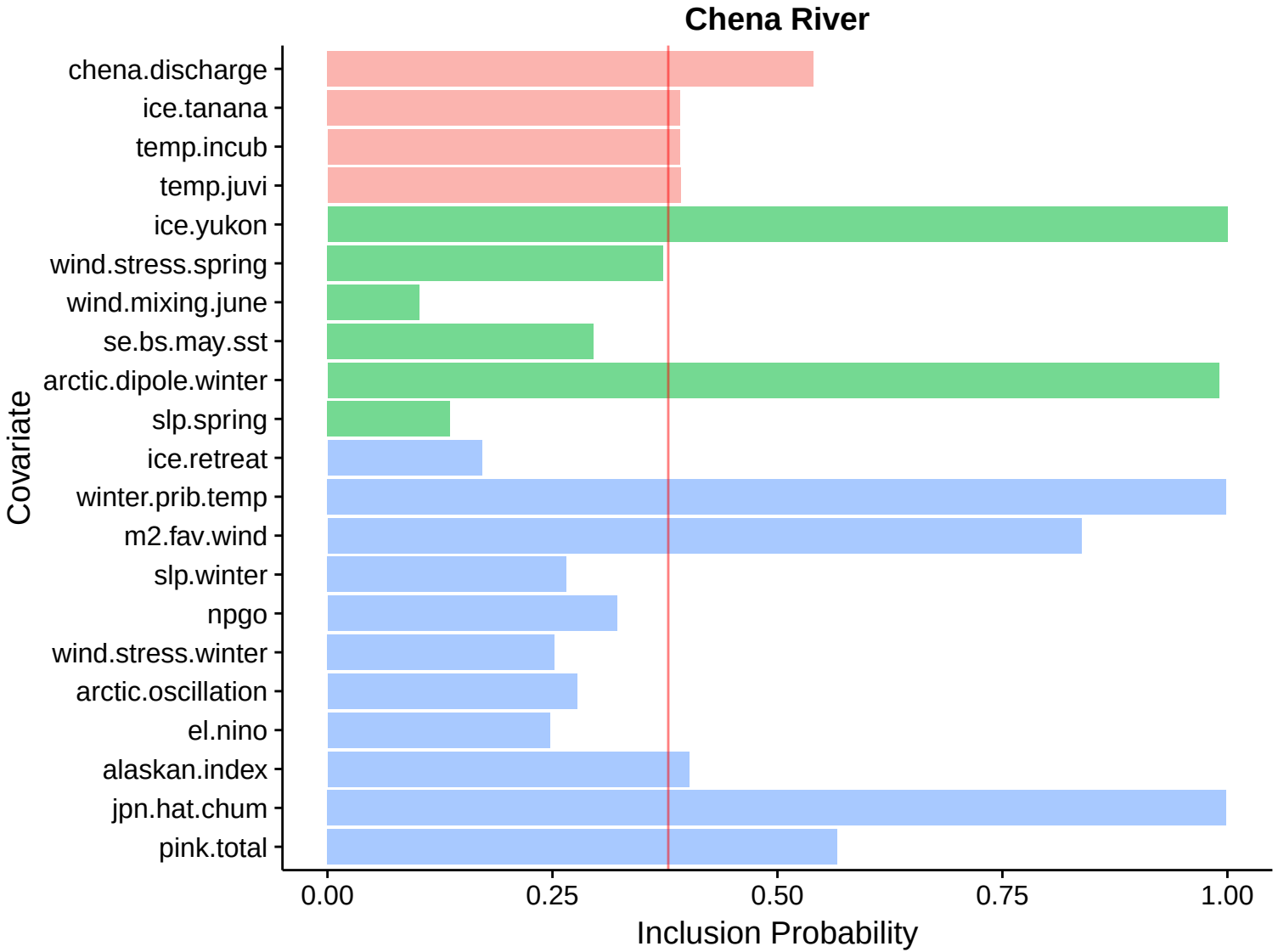

eta.zero.cap[1]
eta.zero.cap[2]
0e+00
2e+06
4e+06
6e+06
8e+06
1e+07
Exp Beta Zero Cap

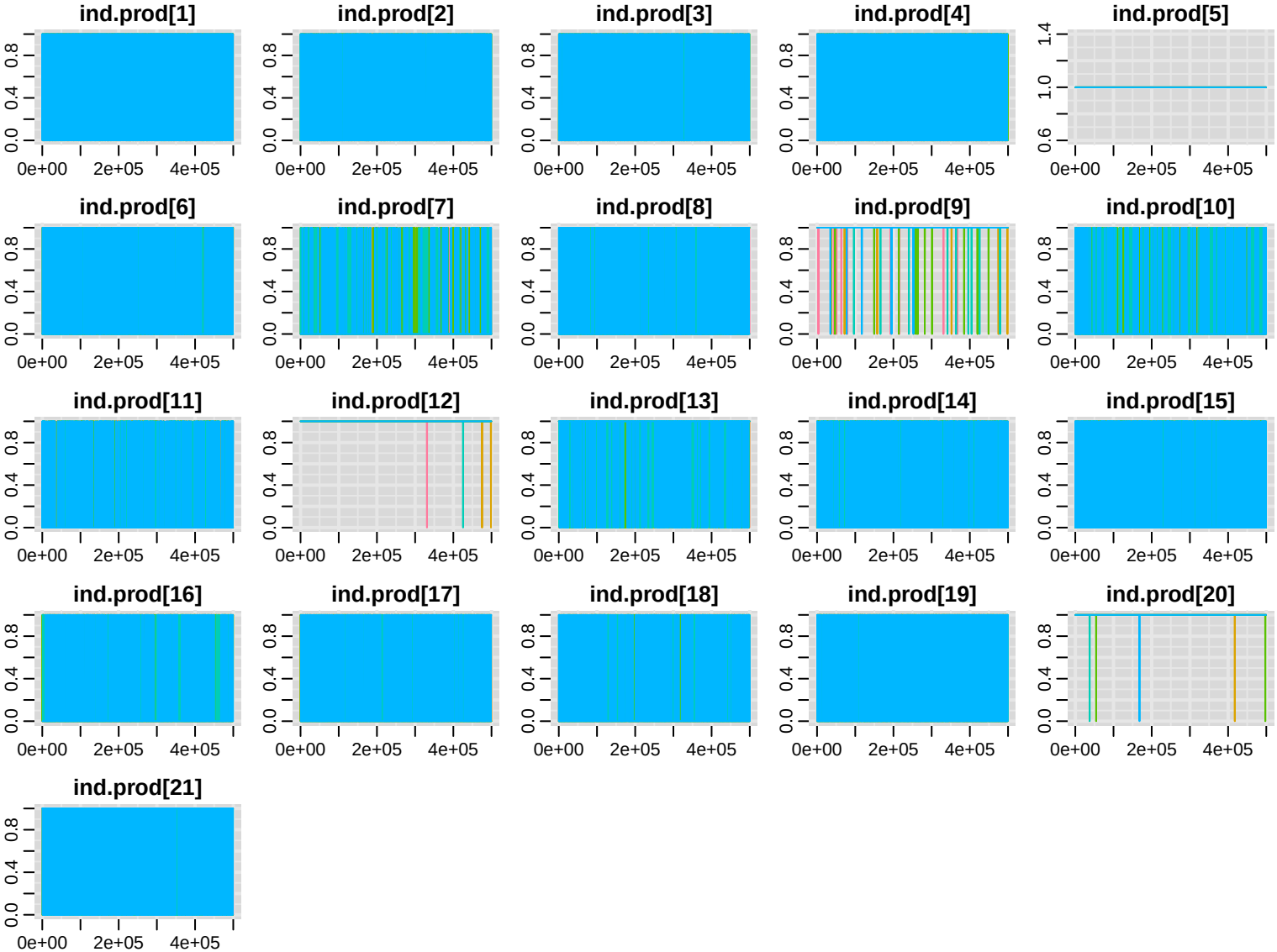

beta.prod[12]
beta.prod[9]
beta.prod[13]
beta.prod[19]
beta.prod[15]
beta.prod[14]
beta.prod[4]
beta.prod[17]
beta.prod[7]
beta.prod[11]
beta.prod[10]
beta.prod[3]
beta.prod[2]
beta.prod[16]
beta.prod[18]
beta.prod[8]
beta.prod[6]
beta.prod[21]
beta.prod[1]
beta.prod[5]
beta.prod[20]
−1.5
−1.0
−0.5
0.0
0.5
1.0

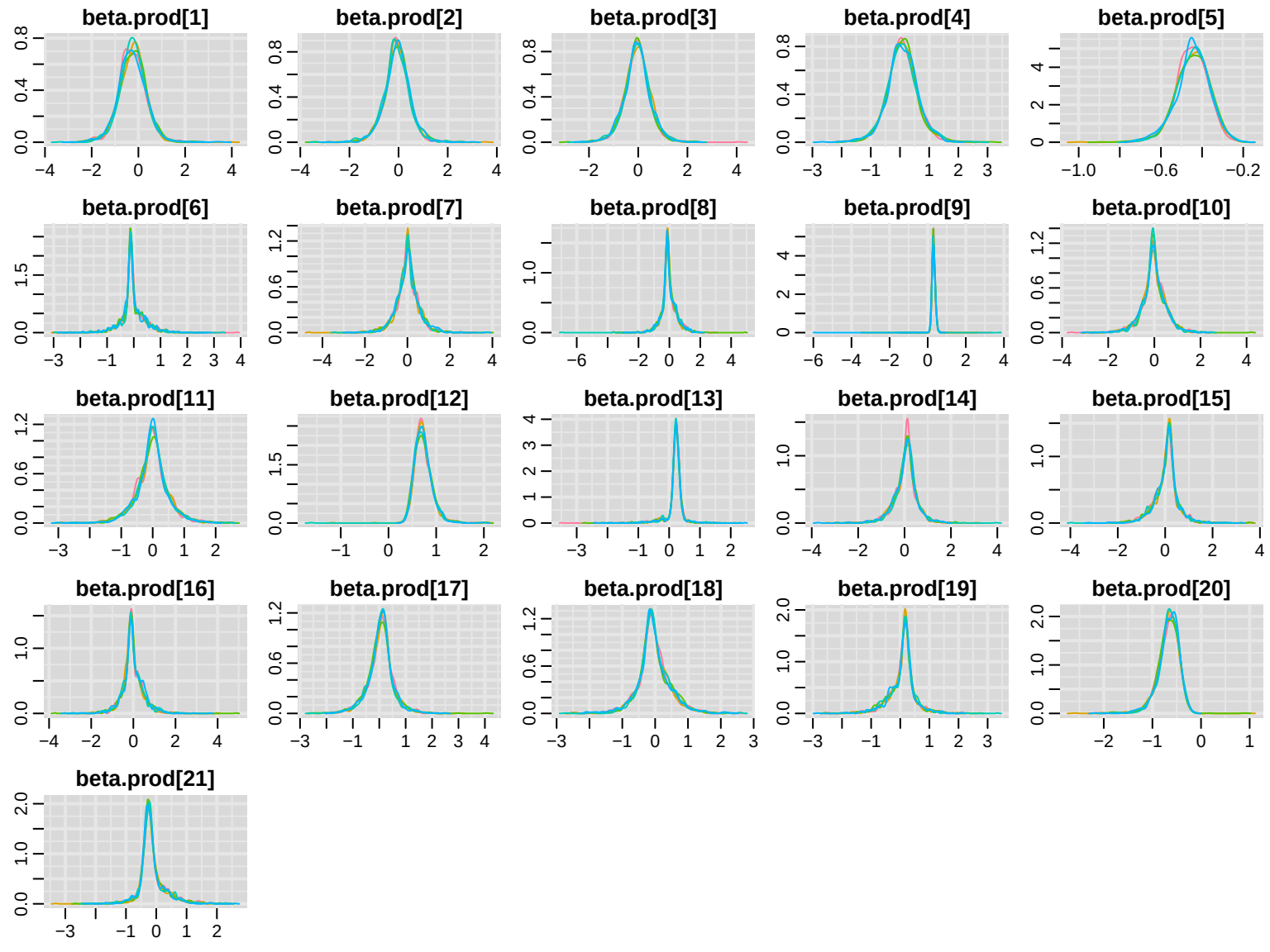

chena
pink.total
jpn.hat.chum
alaskan.index
el.nino
arctic.oscillation
wind.stress.winter
npgo
slp.winter
m2.fav.wind
winter.prib.temp
ice.retreat
slp.spring
arctic.dipole.winter
se.bs.may.sst
wind.mixing.june
wind.stress.spring
ice.yukon
temp.juvi
temp.incub
ice.tanana
chena.discharge
0.0
0.2
0.4
0.6
0.8
1.0
Productivity Inclusion Probability

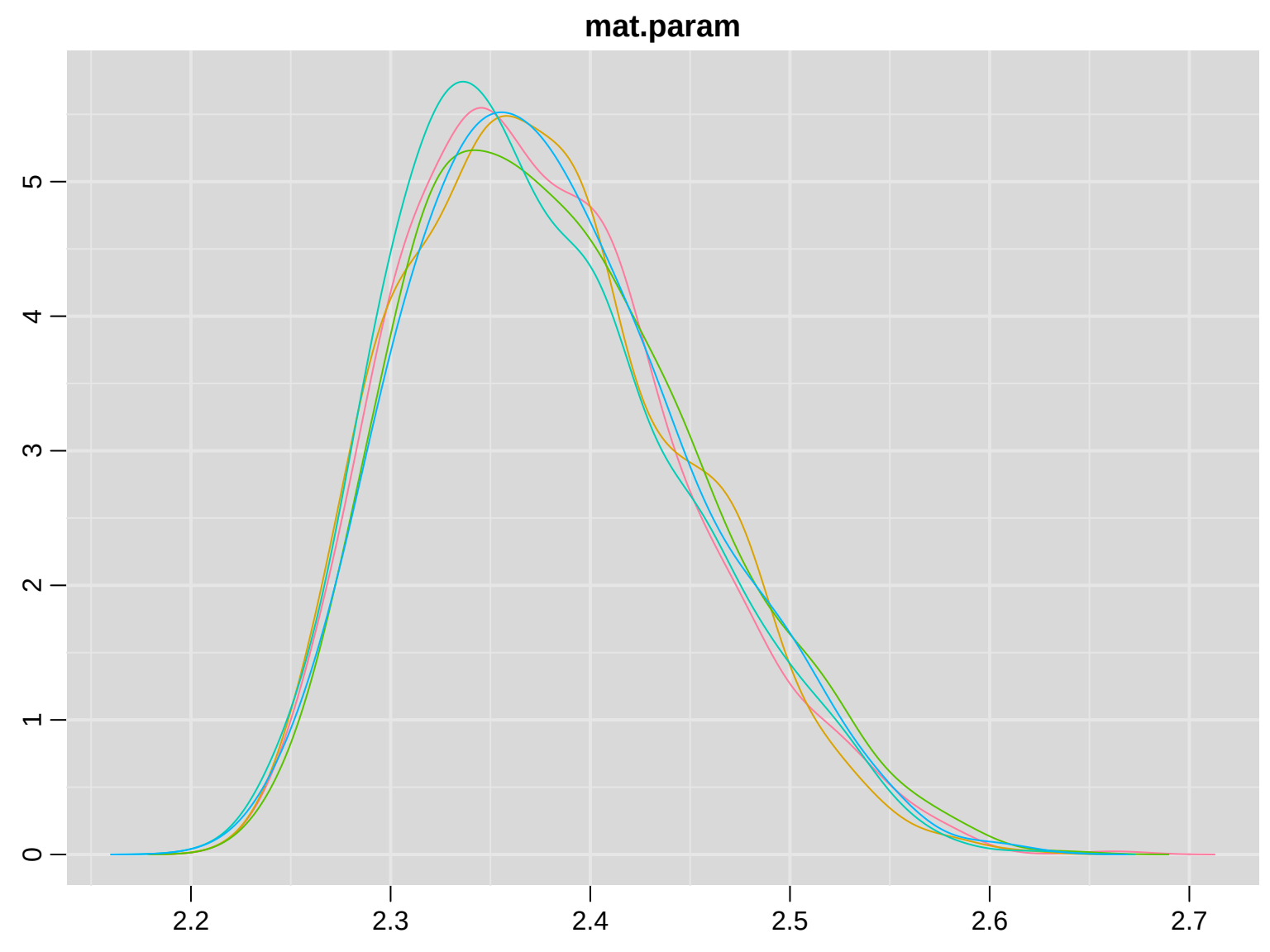

Chena River
chena.discharge
ice.tanana
temp.incub
temp.juvi
ice.yukon
wind.stress.spring
wind.mixing.june
se.bs.may.sst
arctic.dipole.winter
slp.spring
ice.retreat
winter.prib.temp
m2.fav.wind
slp.winter
npgo
wind.stress.winter
arctic.oscillation
el.nino
alaskan.index
jpn.hat.chum
pink.total
Covariate
0.00
0.25
0.50
0.75
1.00
Inclusion Probability
0.75
0.75
var.stage
Upstream
DownstreamNearshore
Ocean 1

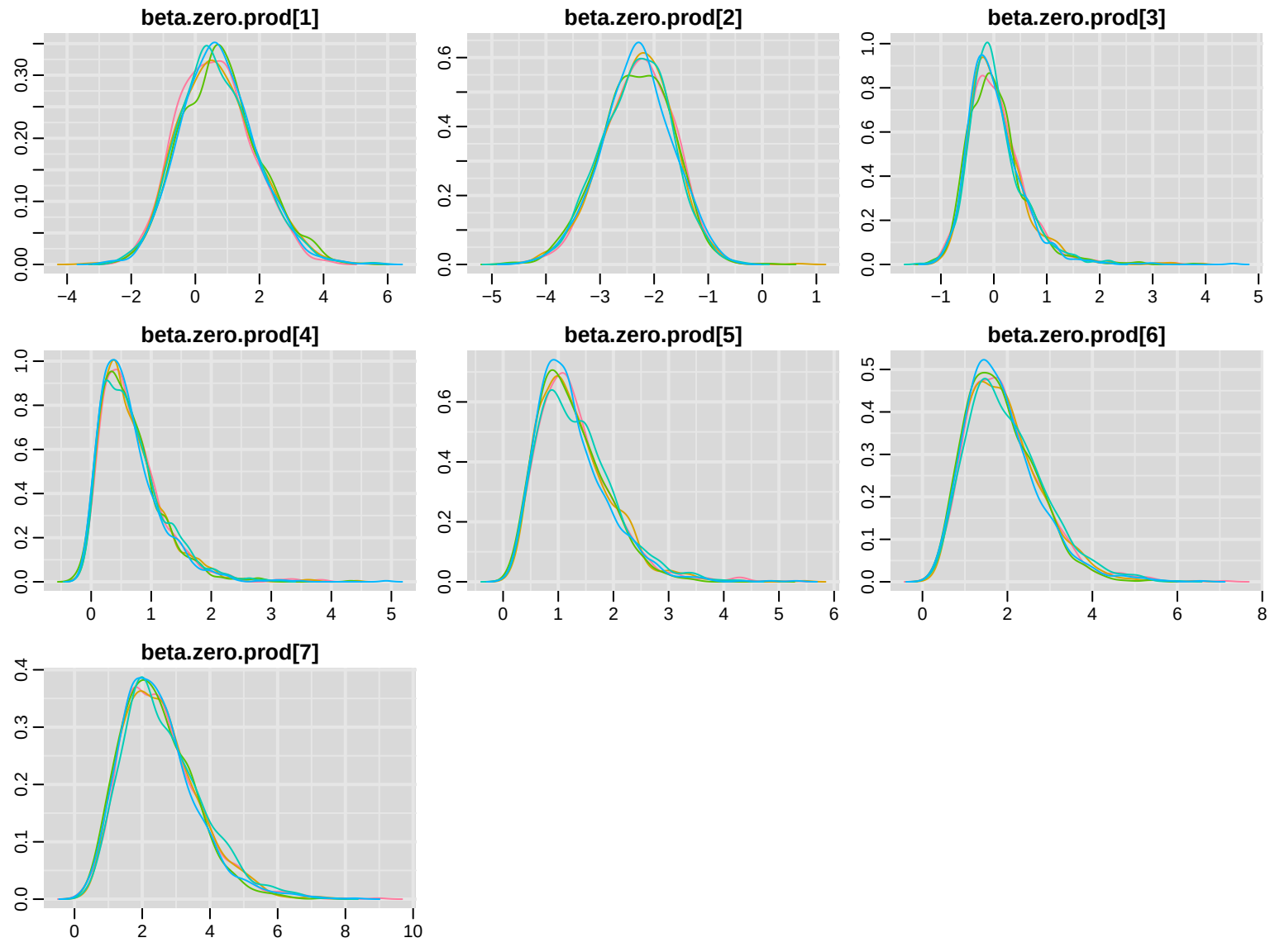

Chena River
chena.discharge
ice.tanana
temp.incub
temp.juvi
ice.yukon
wind.stress.spring
wind.mixing.june
se.bs.may.sst
arctic.dipole.winter
slp.spring
ice.retreat
winter.prib.temp
m2.fav.wind
slp.winter
npgo
wind.stress.winter
arctic.oscillation
el.nino
alaskan.index
jpn.hat.chum
pink.total
Covariate
0.00
0.25
0.50
0.75
1.00
Inclusion Probability

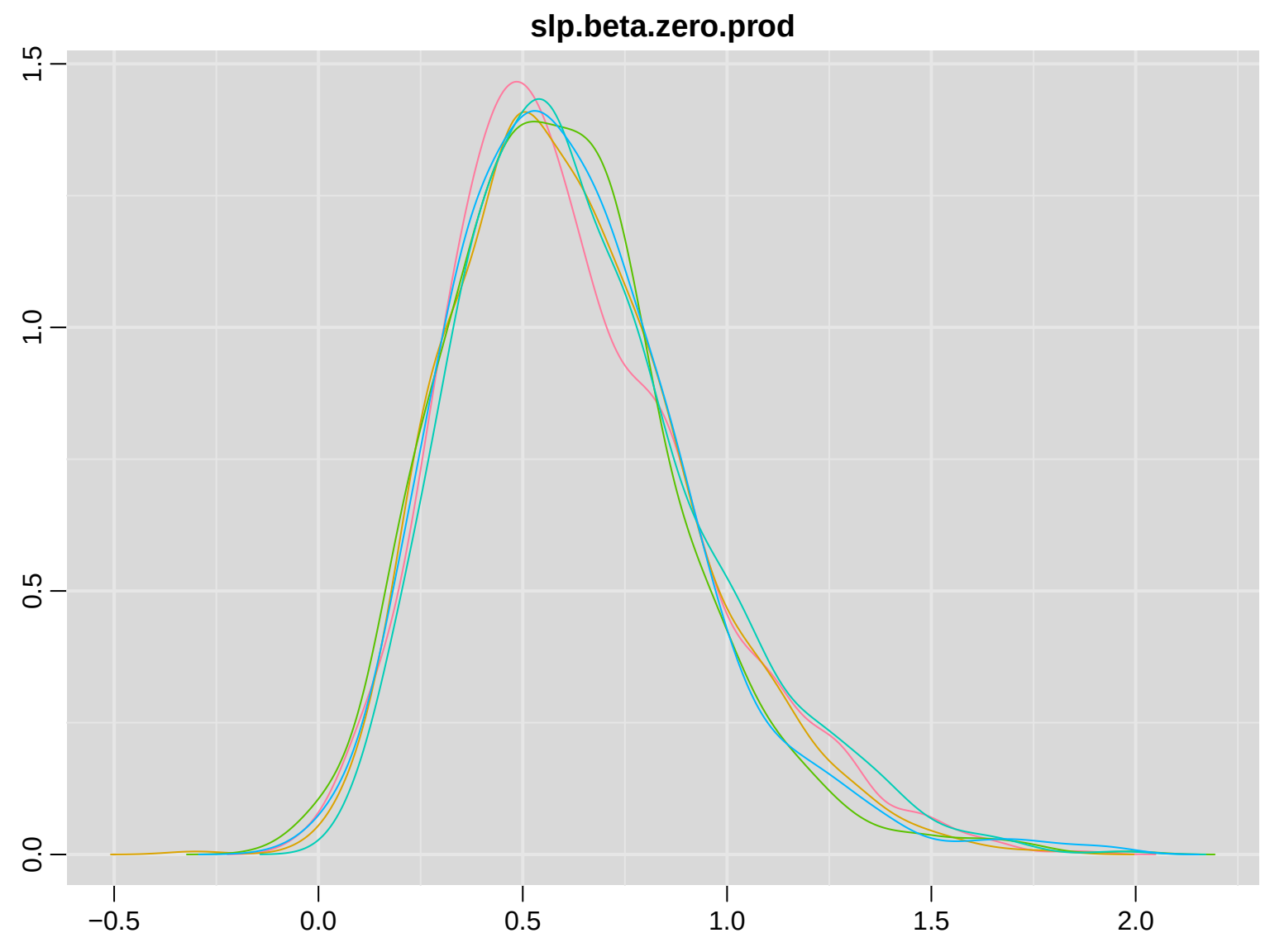

Chena River
chena.discharge
ice.tanana
temp.incub
temp.juvi
ice.yukon
wind.stress.spring
wind.mixing.june
se.bs.may.sst
arctic.dipole.winter
slp.spring
ice.retreat
winter.prib.temp
m2.fav.wind
slp.winter
npgo
wind.stress.winter
arctic.oscillation
el.nino
alaskan.index
jpn.hat.chum
pink.total
Covariate
0.00
0.25
0.50
0.75
1.00
Inclusion Probability

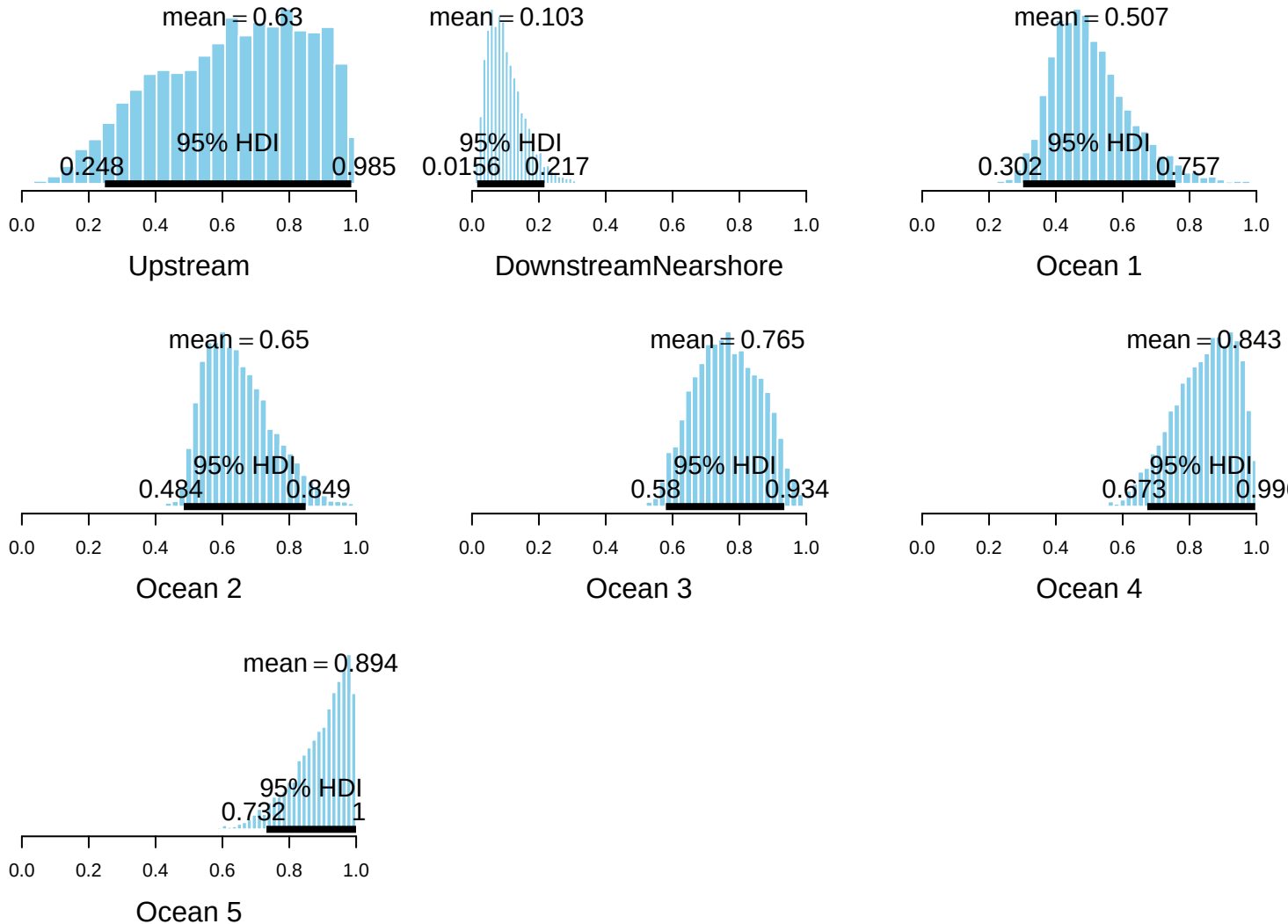

ind.prod[1]
ind.prod[2]
ind.prod[3]
ind.prod[4]
ind.prod[5]
ind.prod[6]
ind.prod[7]
ind.prod[8]
ind.prod[9]
ind.prod[10]
ind.prod[11]
ind.prod[12]
ind.prod[13]
ind.prod[14]
ind.prod[15]
ind.prod[16]
ind.prod[17]
ind.prod[18]
ind.prod[19]
ind.prod[20]
ind.prod[21]
0.0
0.4
0.8
0.6
1.0
1.4
0e+00
2e+05
4e+05

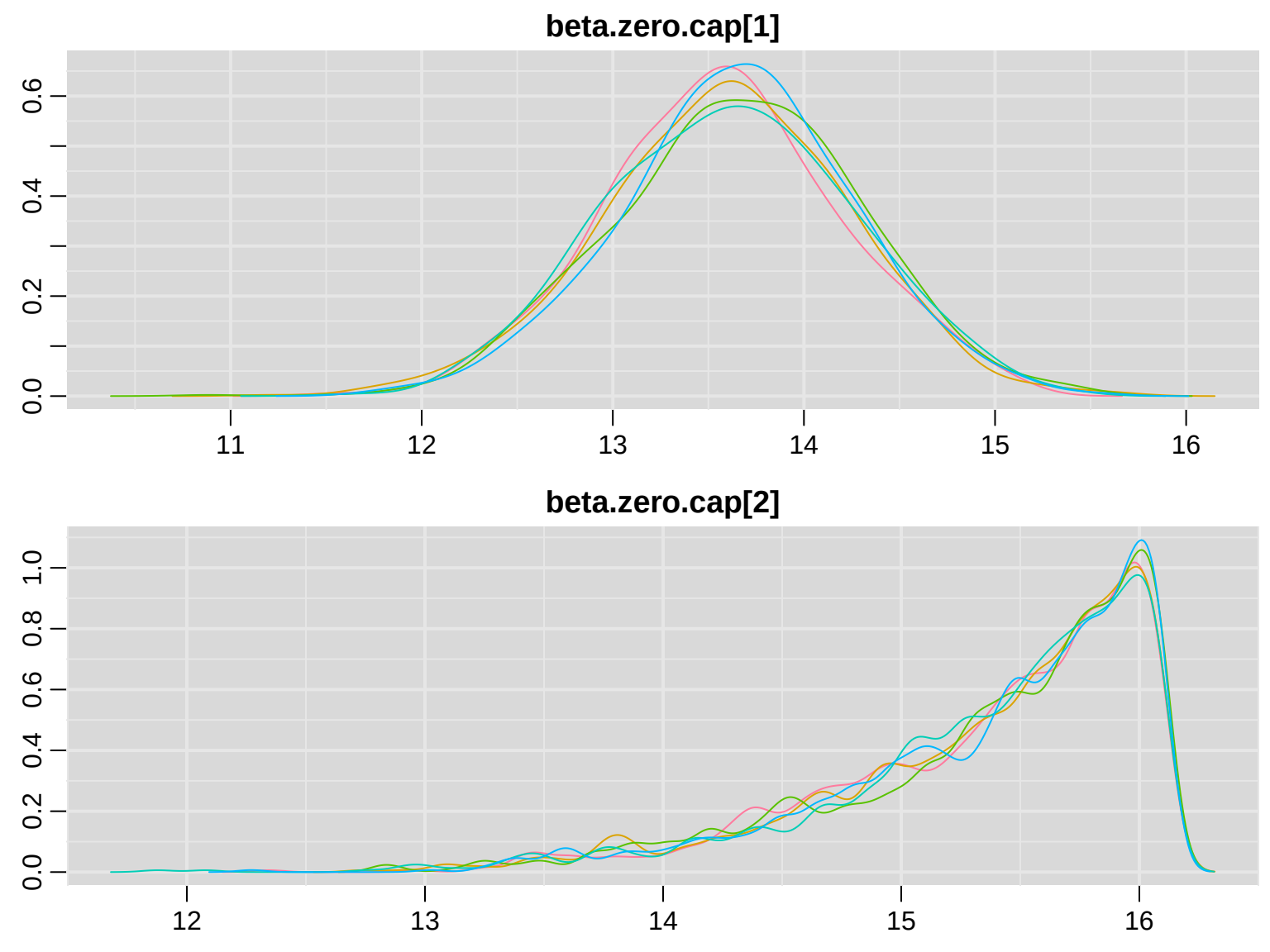

beta.prod[1]
beta.prod[2]
beta.prod[3]
beta.prod[4]
beta.prod[5]
beta.prod[6]
beta.prod[7]
beta.prod[8]
beta.prod[9]
beta.prod[10]
beta.prod[11]
beta.prod[12]
beta.prod[13]
beta.prod[14]
beta.prod[15]
beta.prod[16]
beta.prod[17]
beta.prod[18]
beta.prod[19]
beta.prod[20]
beta.prod[21]

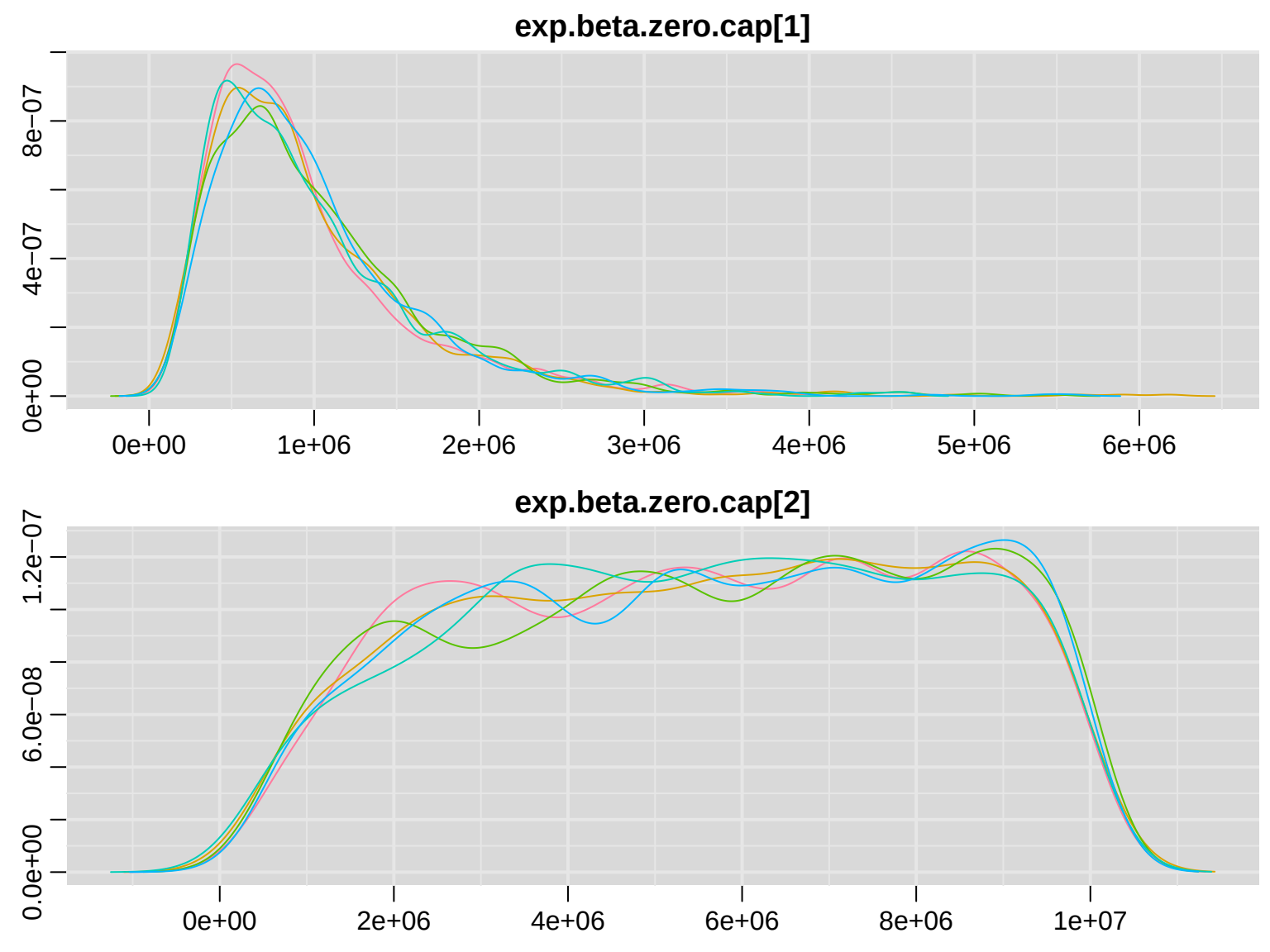

mat.param
0
1
2
3
4
5
2.2
2.3
2.4
2.5
2.6
2.7

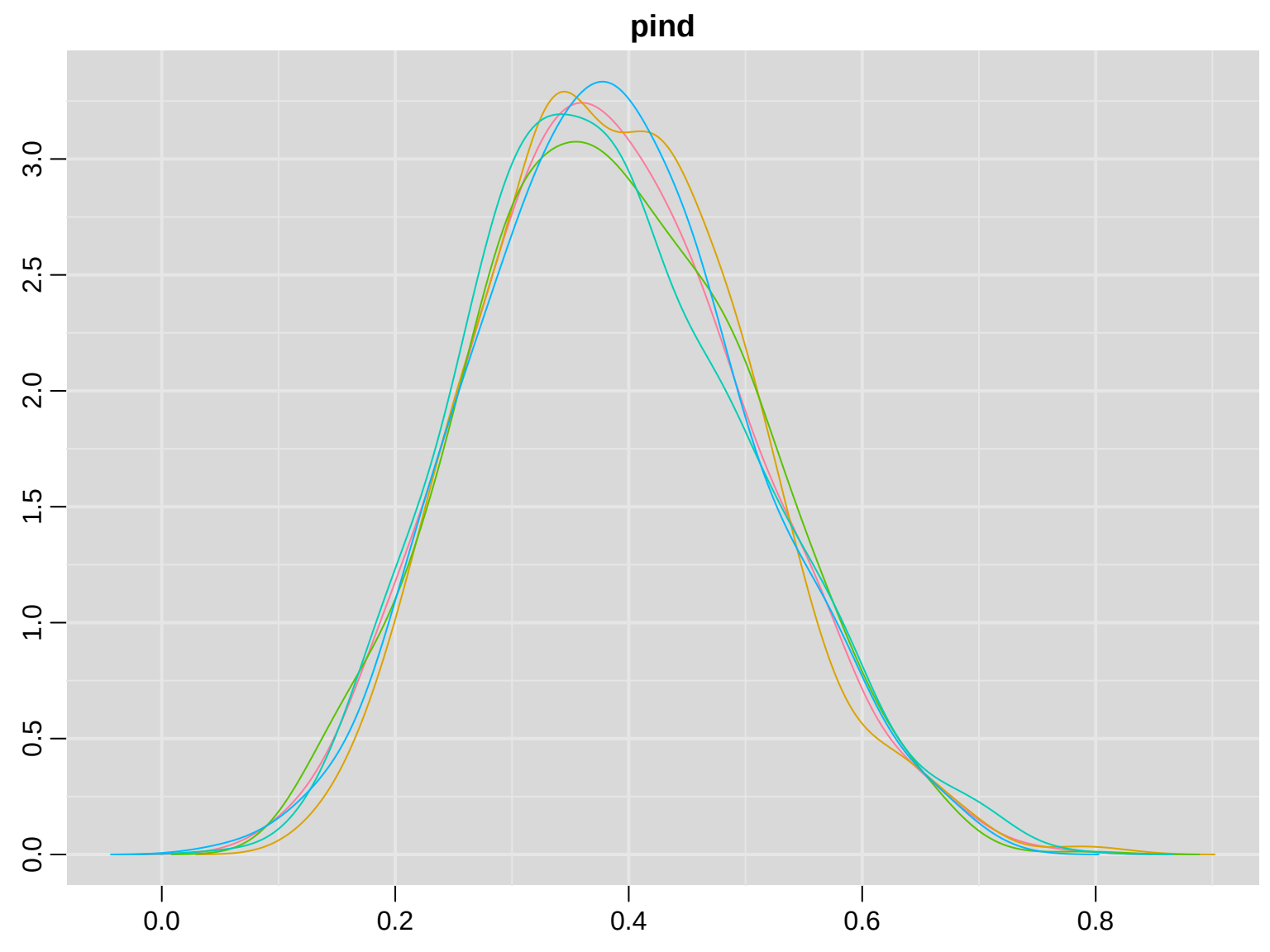

beta.zero.prod[1]
beta.zero.prod[2]
beta.zero.prod[3]
beta.zero.prod[4]
beta.zero.prod[5]
beta.zero.prod[6]
beta.zero.prod[7]

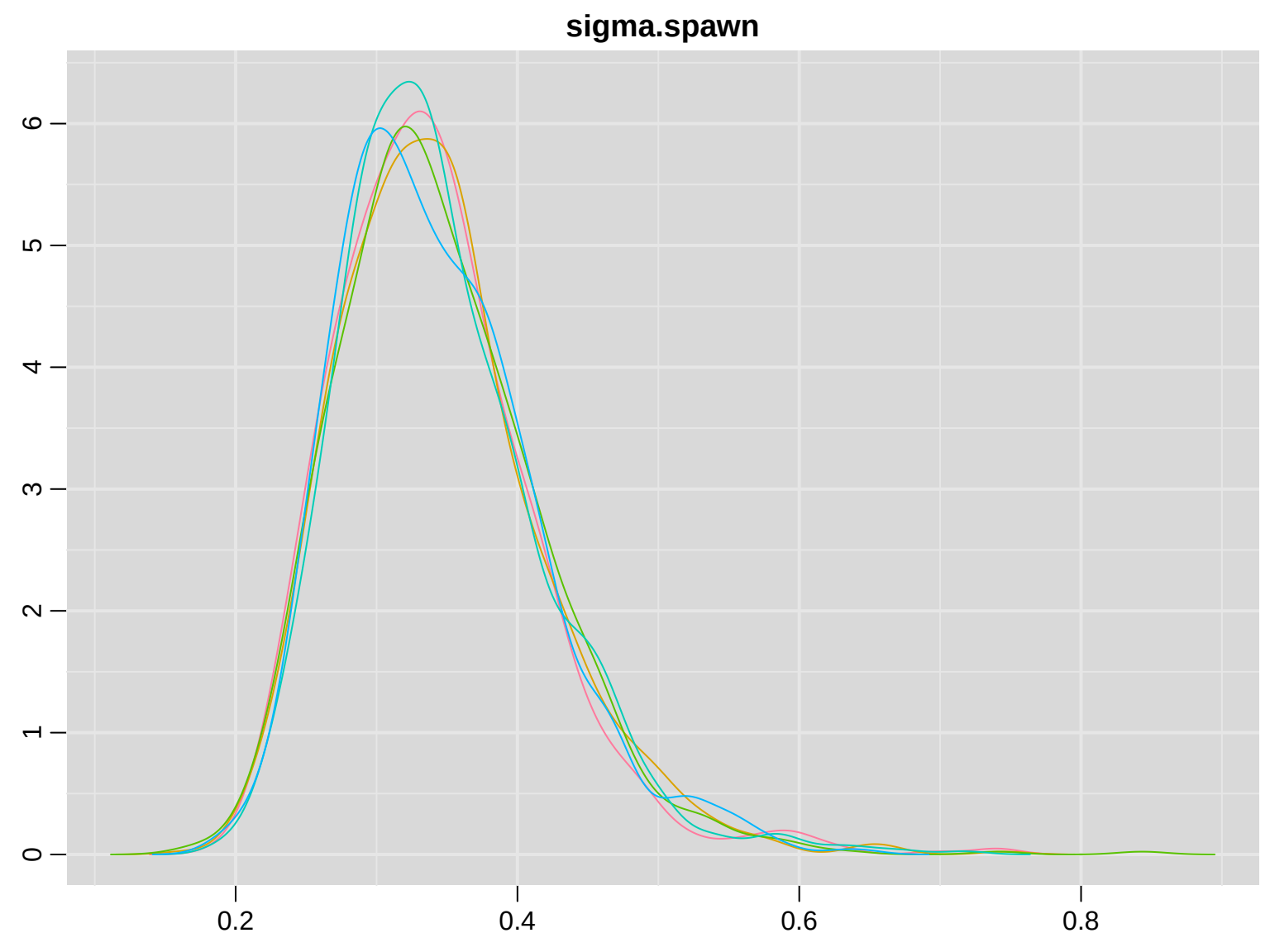

slp.beta.zero.prod
1.5
1.0
0.5
0.0
−0.5
0.0
0.5
1.0
1.5
2.0

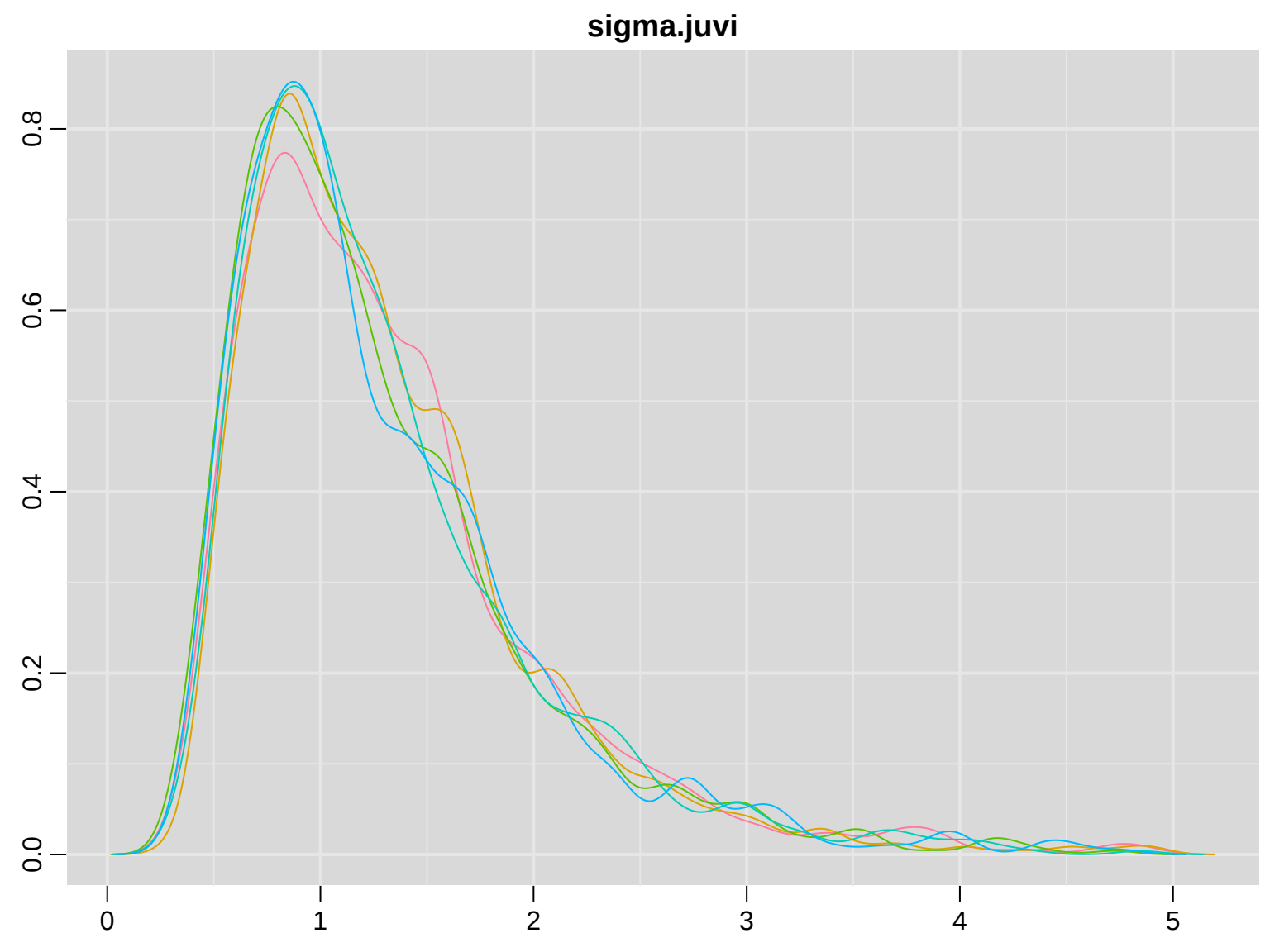

BASELINE SURVIVAL: inv.logit(Beta Zero Prod)
mean = 0.63
95% HDI
0.248
0.985
0.0
0.2
0.4
0.6
0.8
1.0
Upstream
mean = 0.103
95% HDI
0.0156
0.217
DownstreamNearshore
mean = 0.507
95% HDI
0.302
0.757
Ocean 1
mean = 0.65
95% HDI
0.484
0.849
Ocean 2
mean = 0.765
95% HDI
0.58
0.934
Ocean 3
mean = 0.843
95% HDI
0.673
0.996
Ocean 4
mean = 0.894
95% HDI
0.732
1
Ocean 5

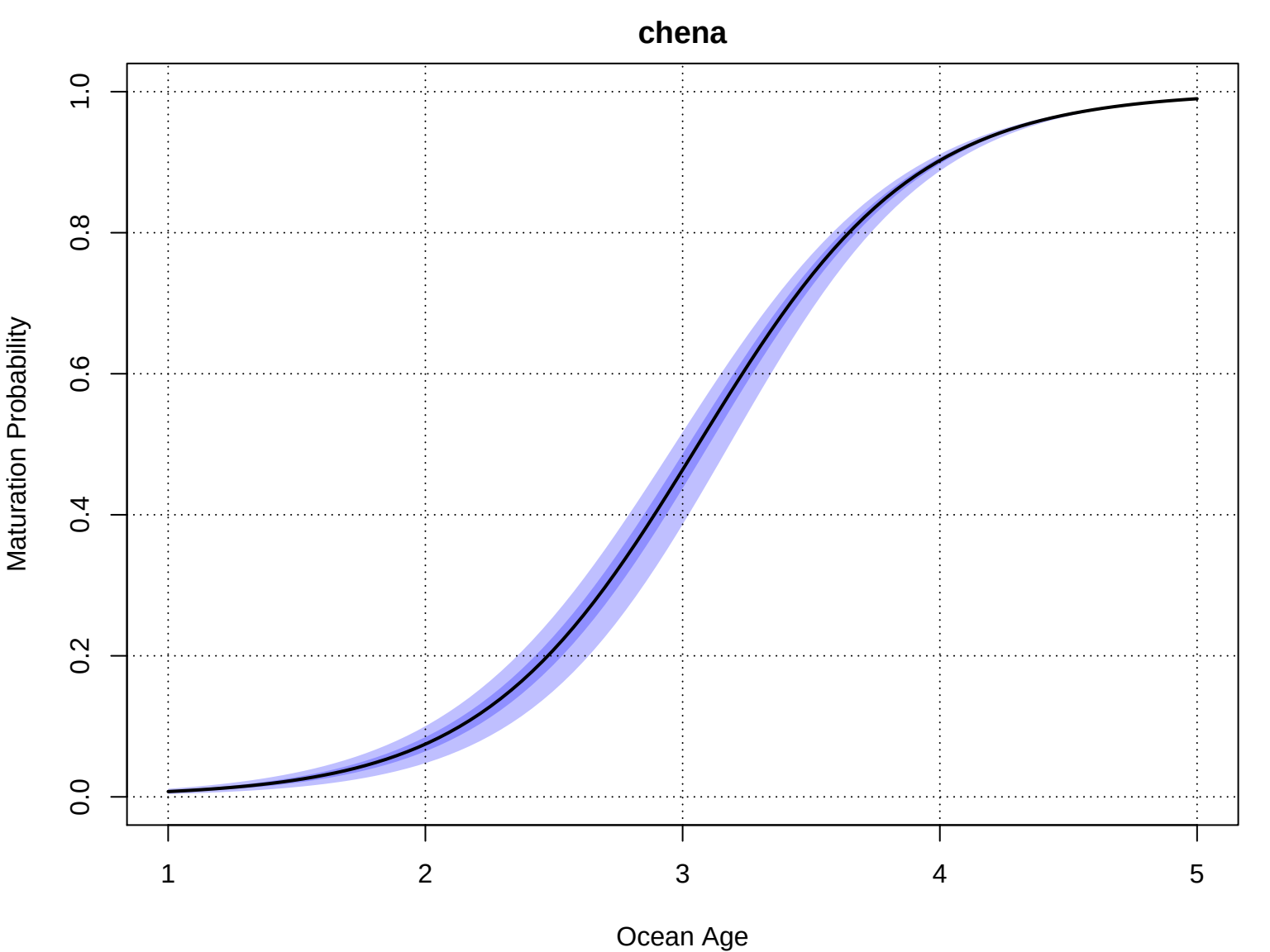

beta.zero.cap[1]
0.0
0.2
0.4
0.6
11
12
13
14
15
16
beta.zero.cap[2]
0.0
0.2
0.4
0.6
0.8
1.0
12
13
14
15
16

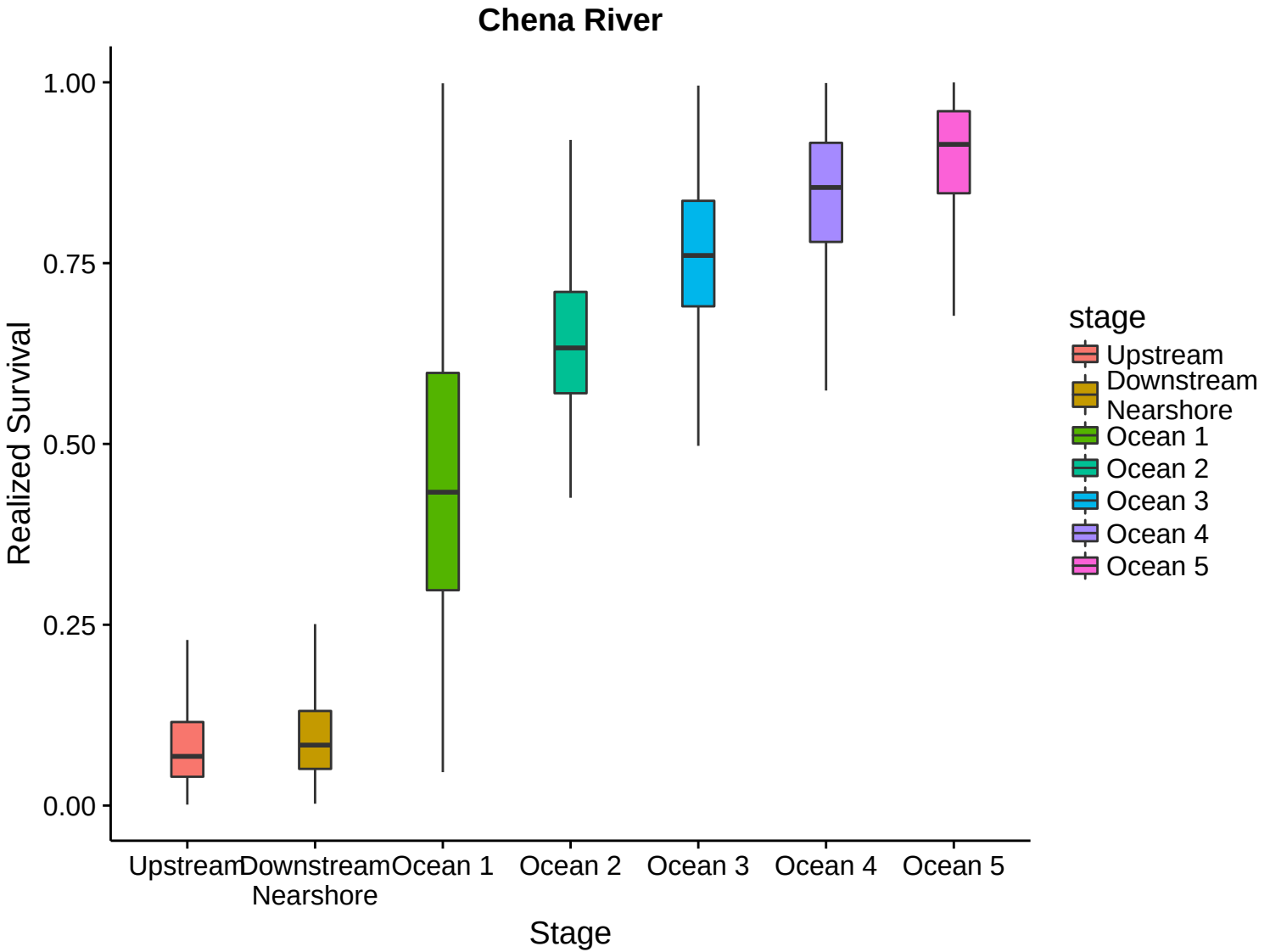

exp.beta.zero.cap[1]
0e+00
4e−07
8e−07
0e+00
1e+06
2e+06
3e+06
4e+06
5e+06
6e+06
exp.beta.zero.cap[2]
0.0e+00
6.0e−08
1.2e−07
0e+00
2e+06
4e+06
6e+06
8e+06
1e+07

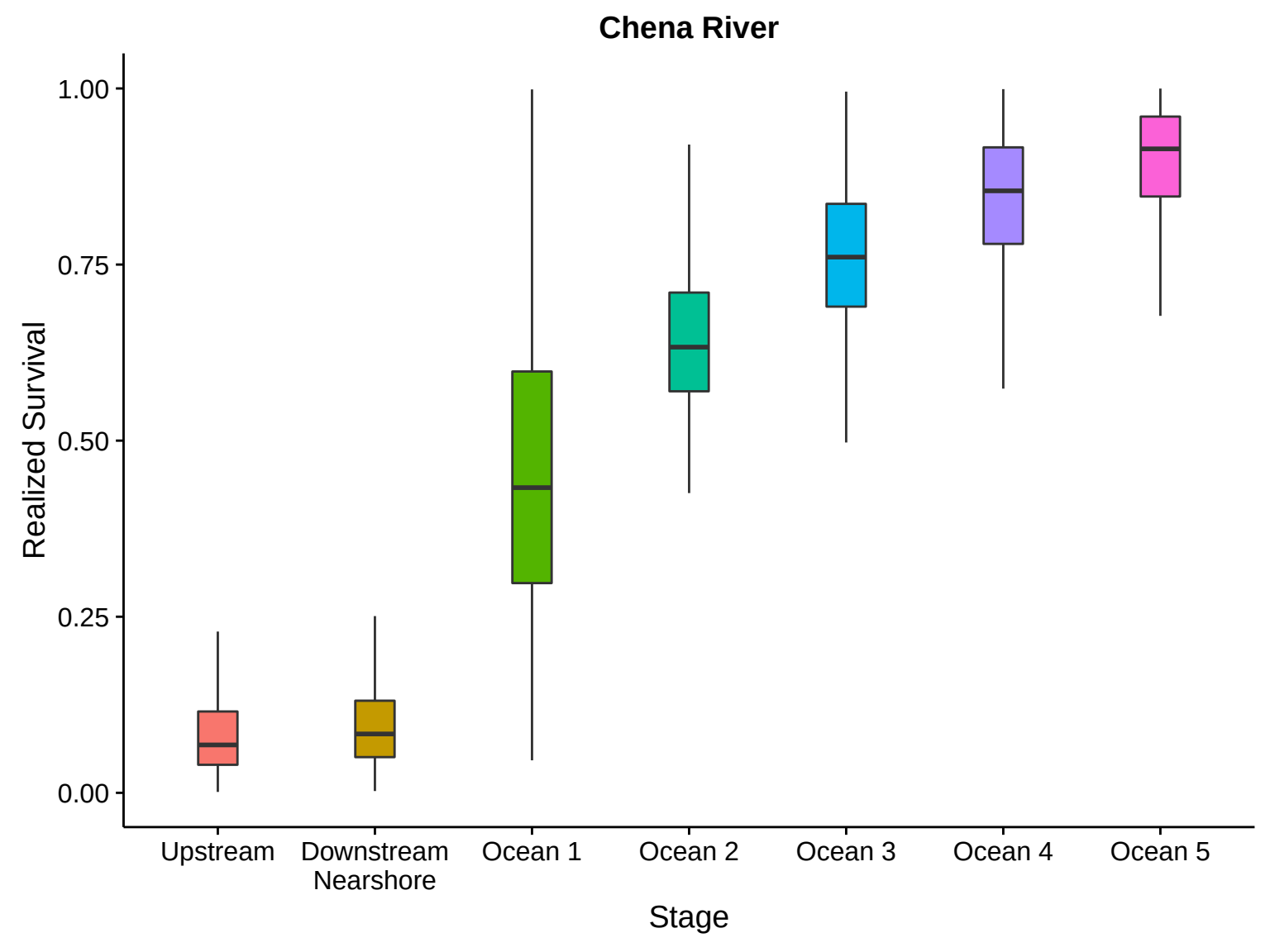

pind
0.0
0.5
1.0
1.5
2.0
2.5
3.0
0.0
0.2
0.4
0.6
0.8

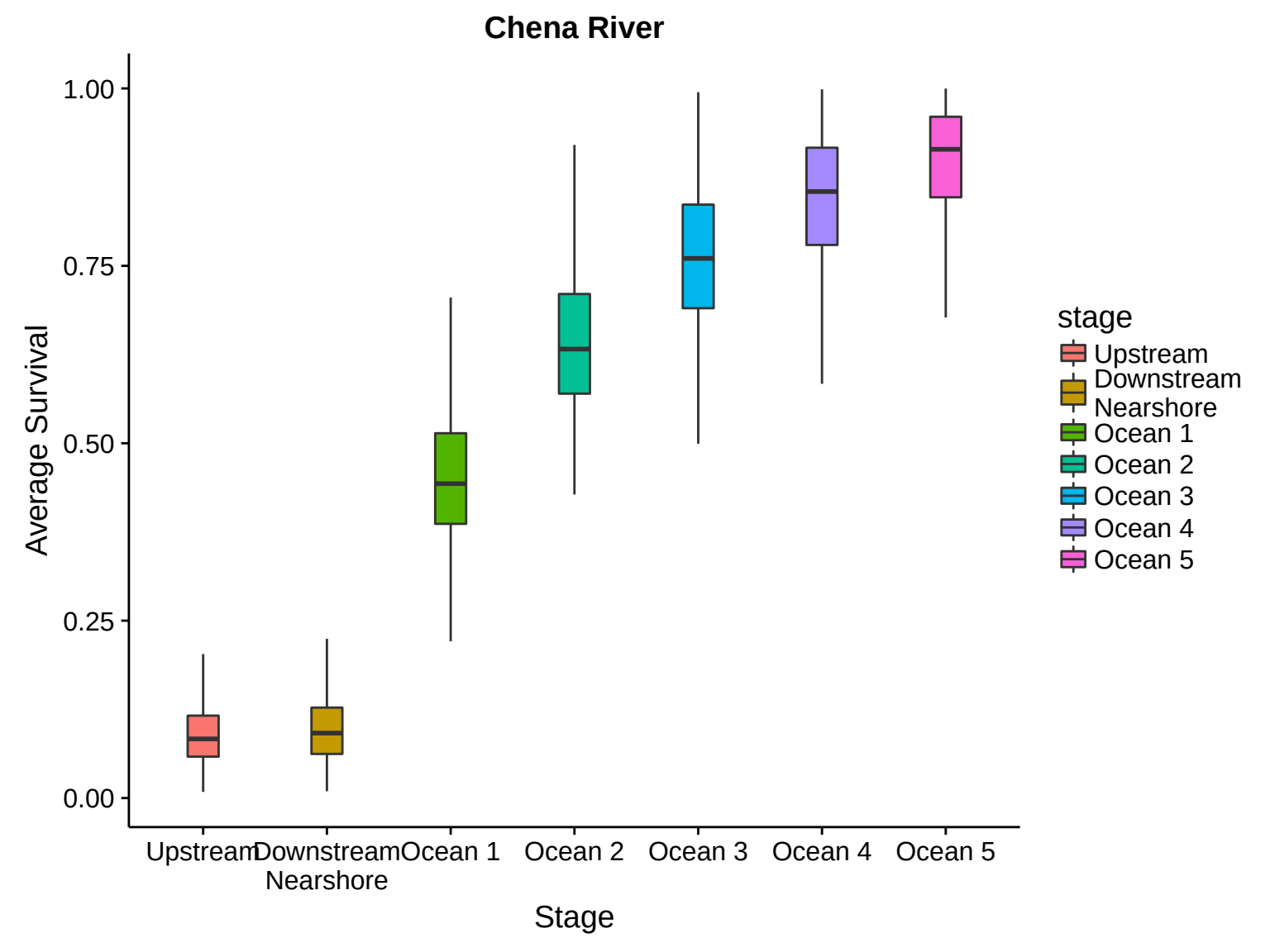

sigma.spawn
0
1
2
3
4
5
6
0.2
0.4
0.6
0.8

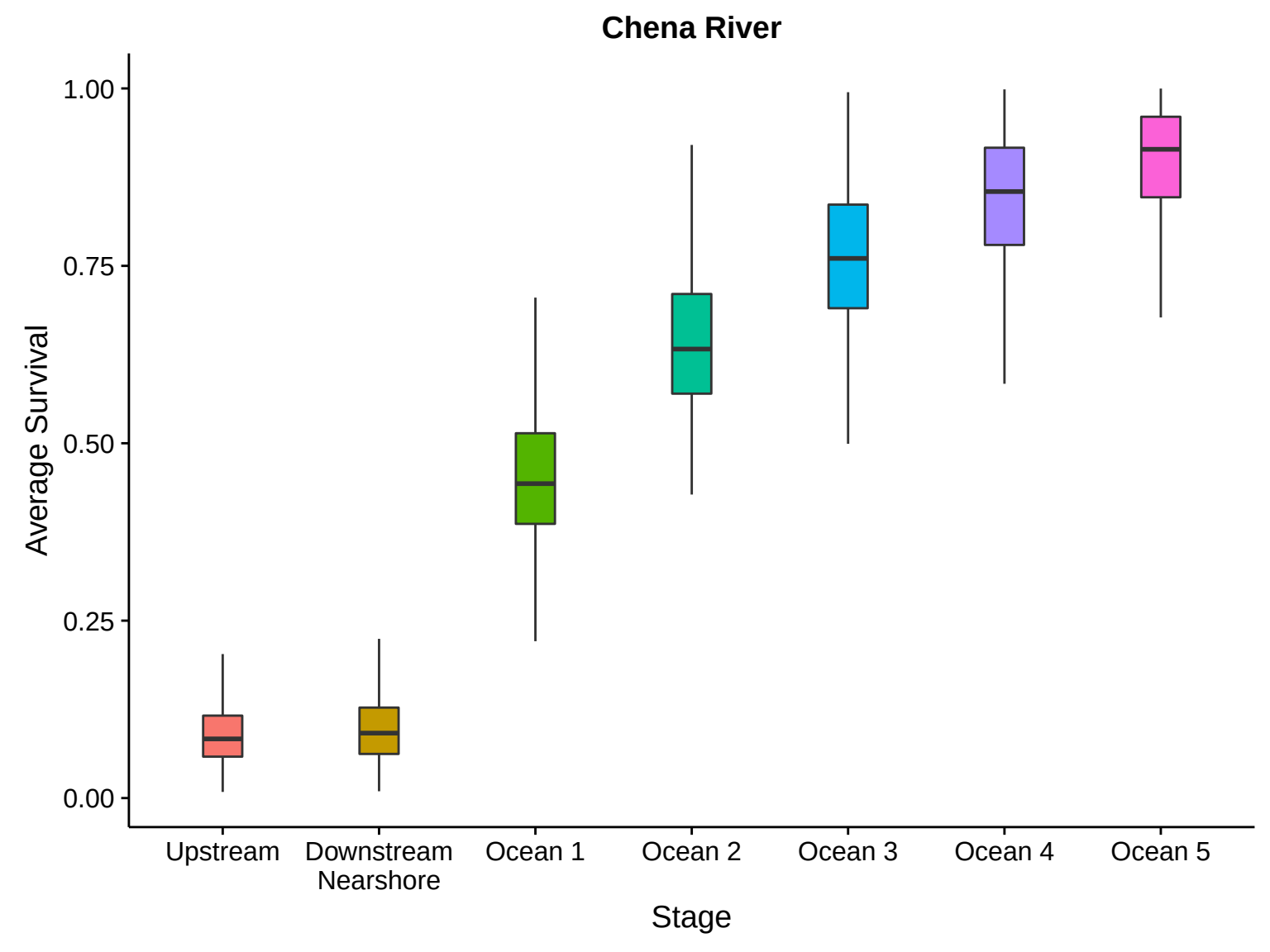

sigma.juvi
0.0
0.2
0.4
0.6
0.8
0
1
2
3
4
5

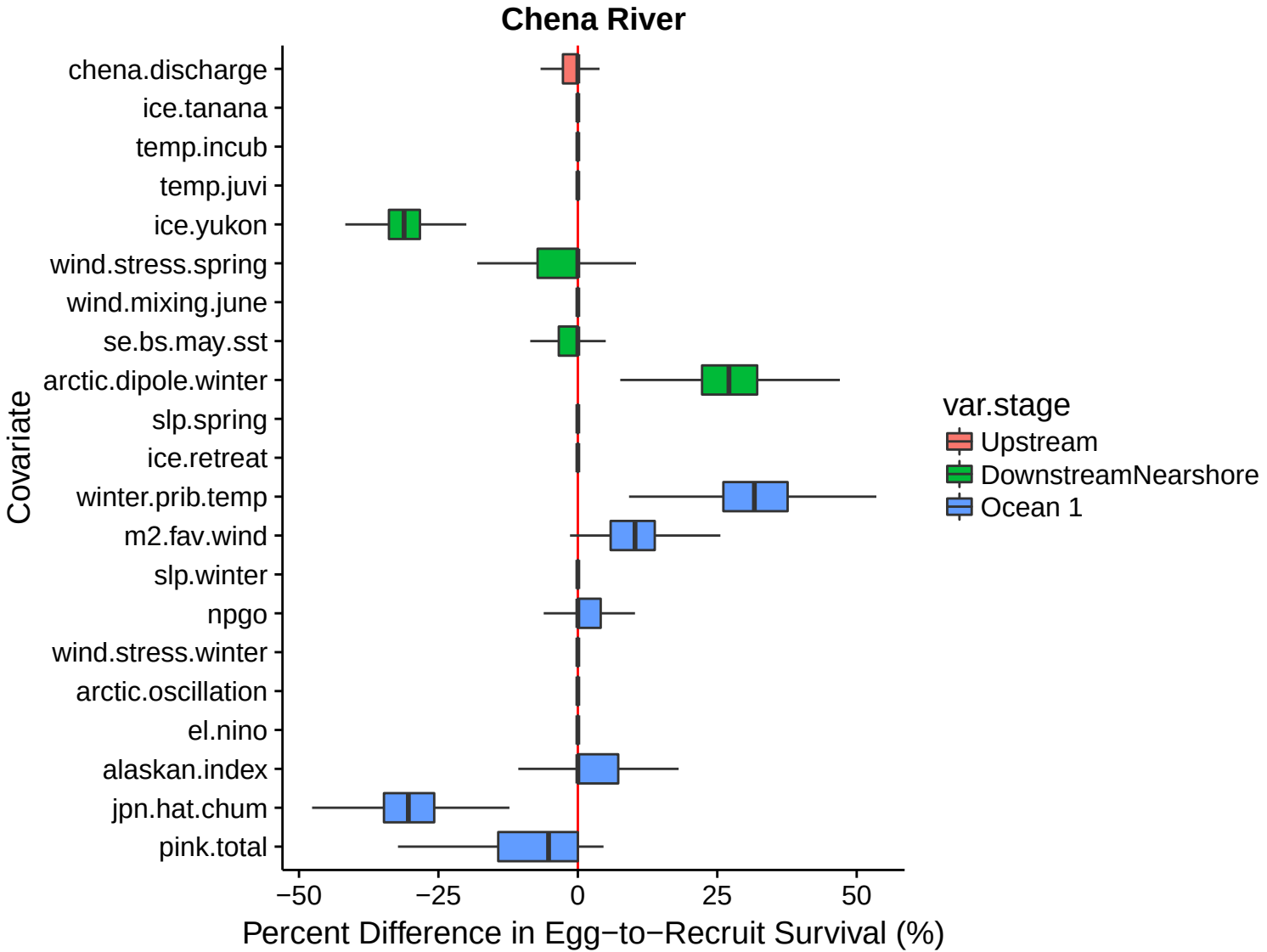

chena
Maturation Probability
0.0
0.2
0.4
0.6
0.8
1.0
1
2
3
4
5
Ocean Age

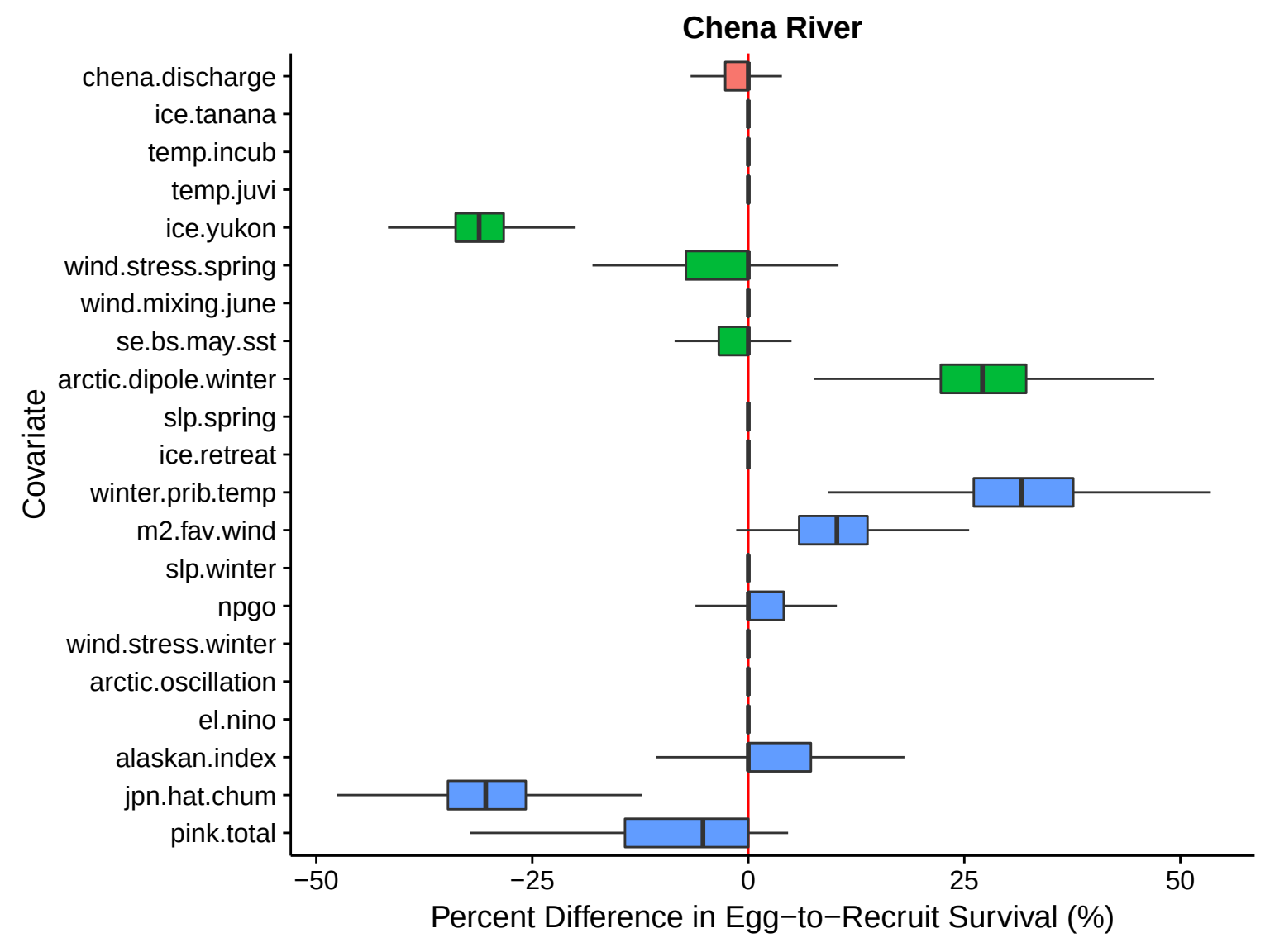

Chena River
1.00
0.75
0.50
0.25
0.00
Realized Survival
Upstream
Downstream
Nearshore
Ocean 1
Ocean 2
Ocean 3
Ocean 4
Ocean 5
Stage
stage
Upstream
Downstream
Nearshore
Ocean 1
Ocean 2
Ocean 3
Ocean 4
Ocean 5

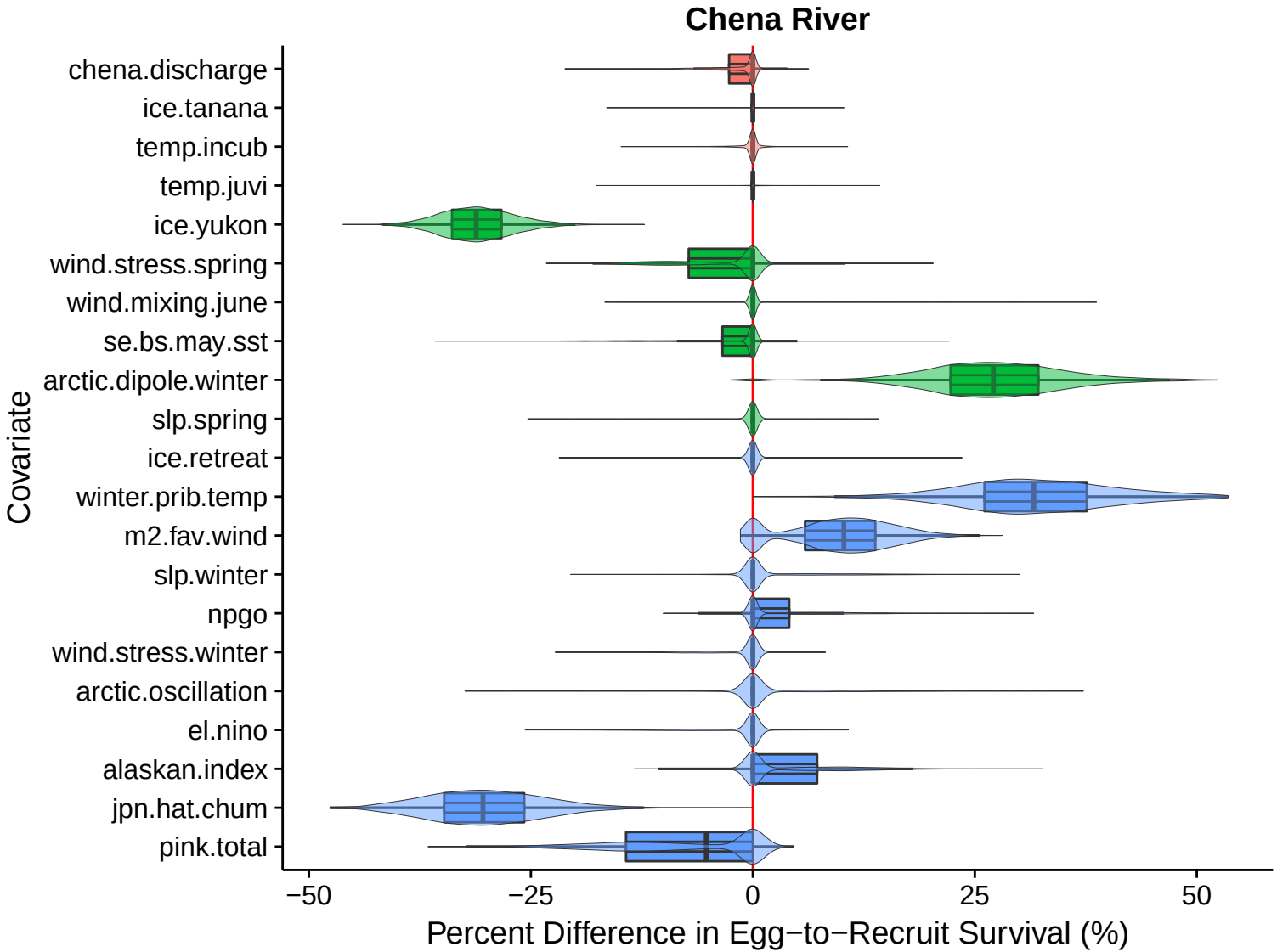

Chena River
1.00
0.75
0.50
0.25
0.00
Realized Survival
Upstream
Downstream
Nearshore
Ocean 1
Ocean 2
Ocean 3
Ocean 4
Ocean 5
Stage

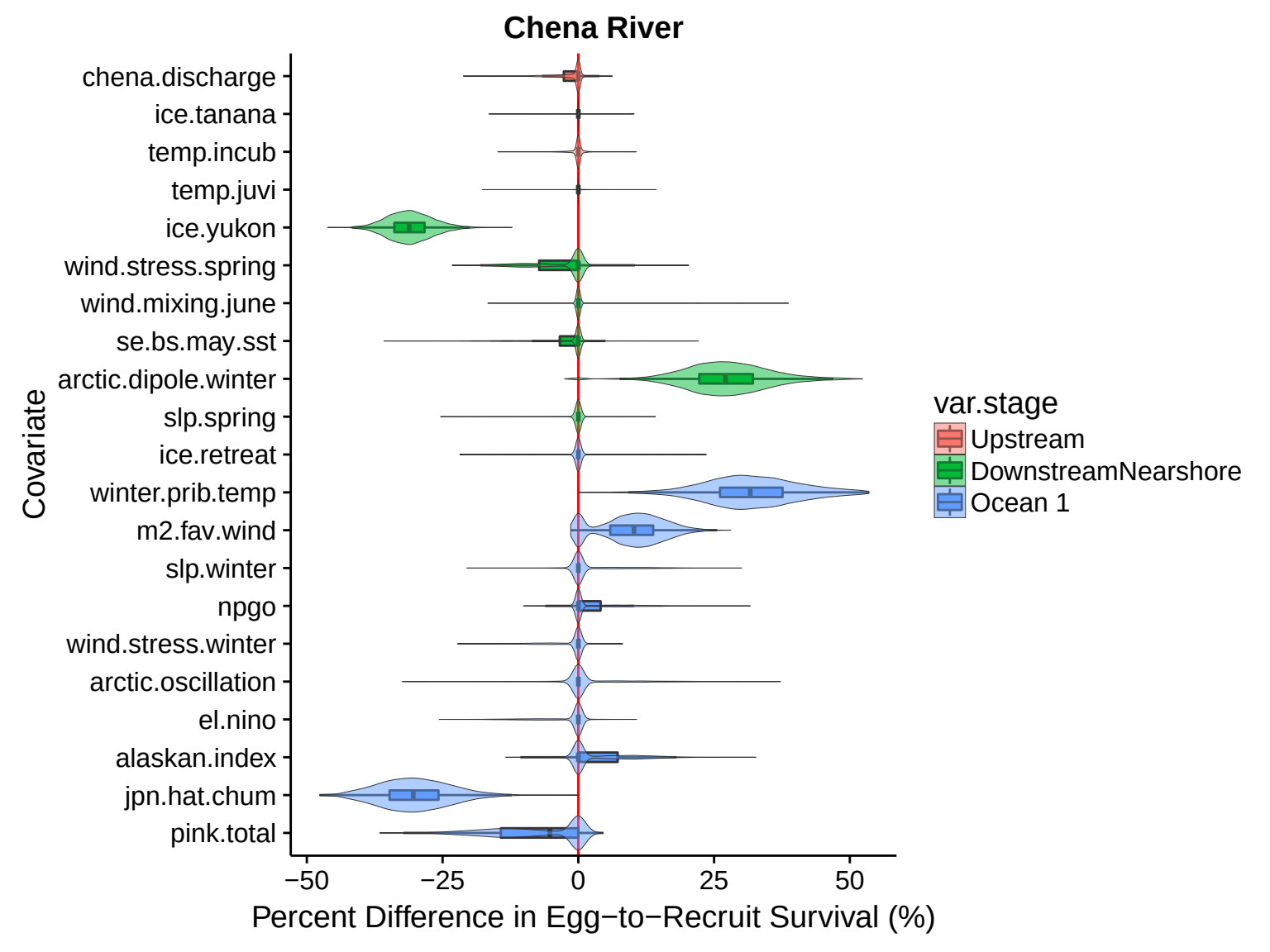

Chena River
1.00
0.75
0.50
0.25
0.00
Average Survival
Upstream
Downstream
Nearshore
Ocean 1
Ocean 2
Ocean 3
Ocean 4
Ocean 5
Stage
stage
Upstream
Downstream
Nearshore
Ocean 1
Ocean 2
Ocean 3
Ocean 4
Ocean 5

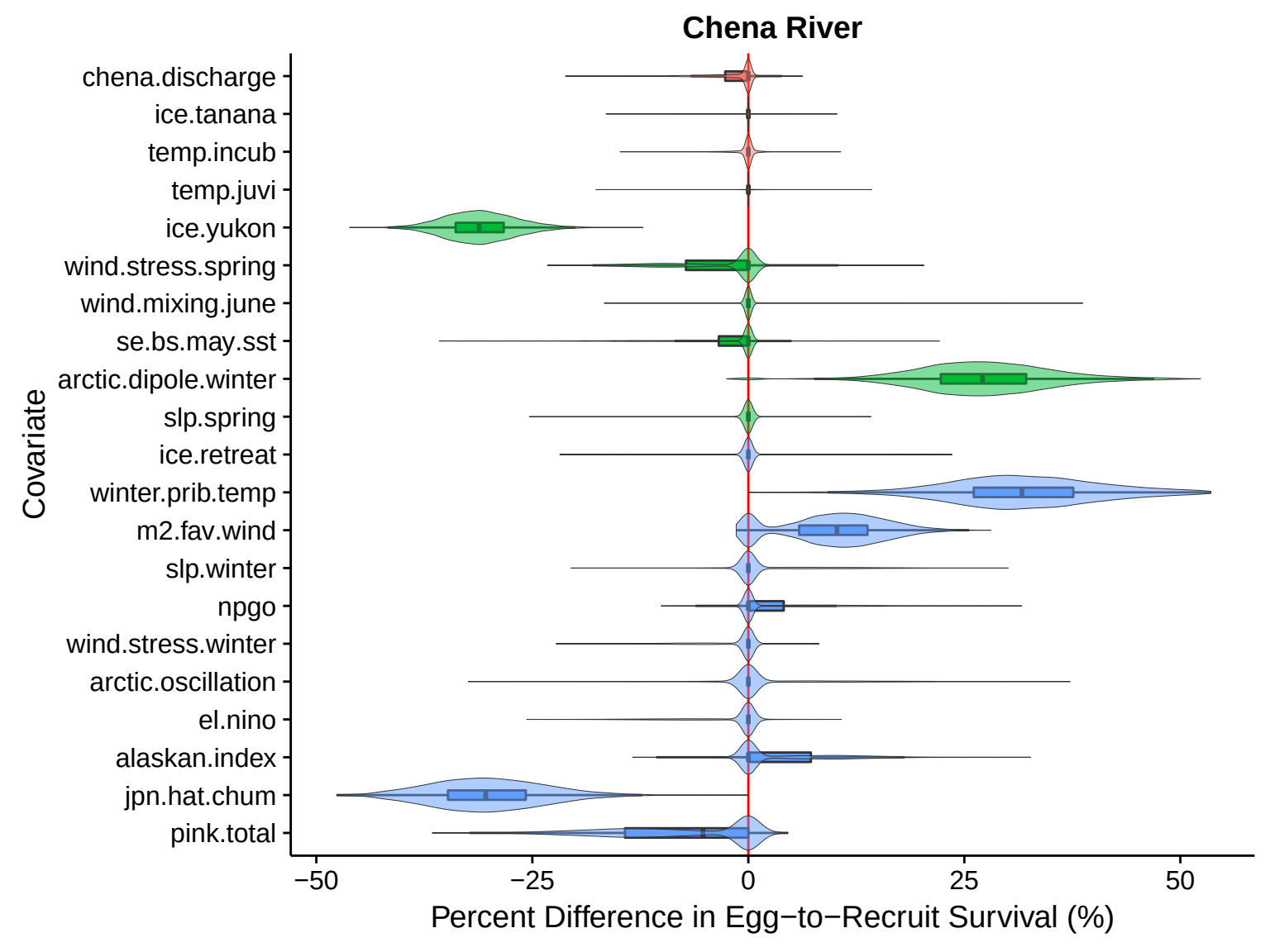

Chena River
1.00
0.75
0.50
0.25
0.00
Average Survival
Upstream
Downstream
Nearshore
Ocean 1
Ocean 2
Ocean 3
Ocean 4
Ocean 5
Stage

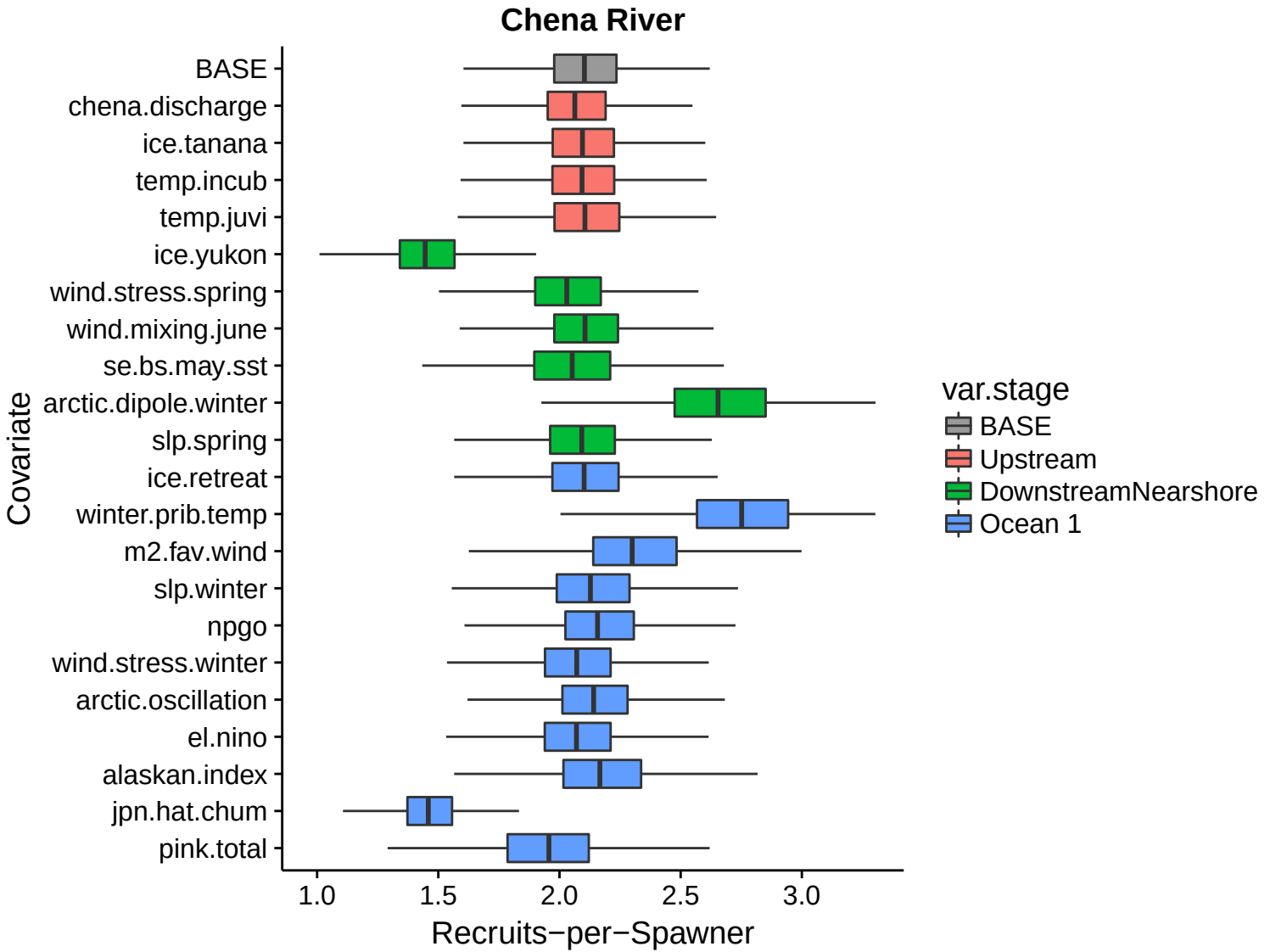

Chena River
chena.discharge
ice.tanana
temp.incub
temp.juvi
ice.yukon
wind.stress.spring
wind.mixing.june
se.bs.may.sst
arctic.dipole.winter
slp.spring
ice.retreat
winter.prib.temp
m2.fav.wind
slp.winter
npgo
wind.stress.winter
arctic.oscillation
el.nino
alaskan.index
jpn.hat.chum
pink.total
Covariate
−50
−25
0
25
50
Percent Difference in Egg−to−Recruit Survival (%)
var.stage
Upstream
DownstreamNearshore
Ocean 1

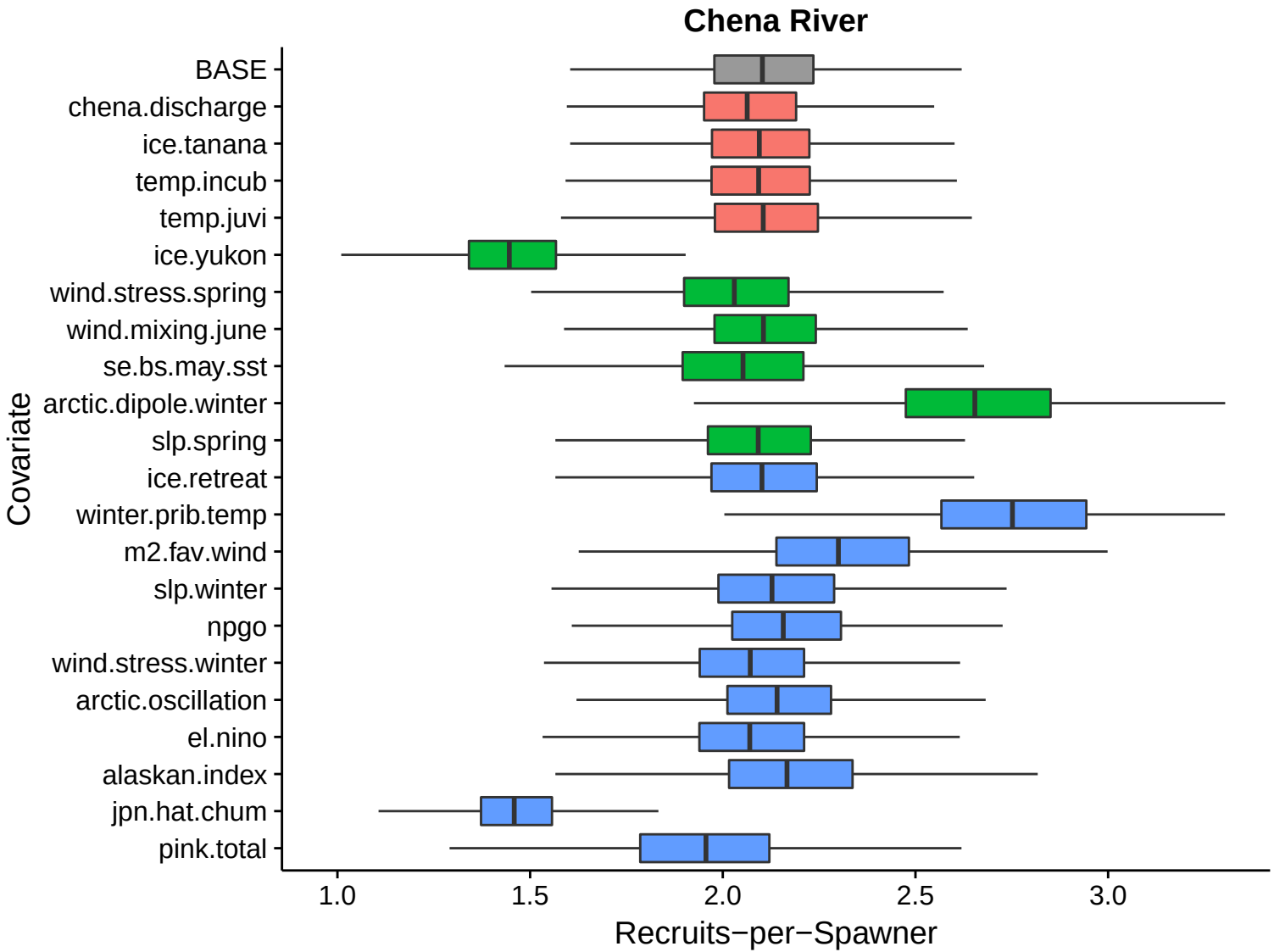

Chena River
chena.discharge
ice.tanana
temp.incub
temp.juvi
ice.yukon
wind.stress.spring
wind.mixing.june
se.bs.may.sst
arctic.dipole.winter
slp.spring
ice.retreat
winter.prib.temp
m2.fav.wind
slp.winter
npgo
wind.stress.winter
arctic.oscillation
el.nino
alaskan.index
jpn.hat.chum
pink.total
Covariate
−50
−25
0
25
50
Percent Difference in Egg−to−Recruit Survival (%)

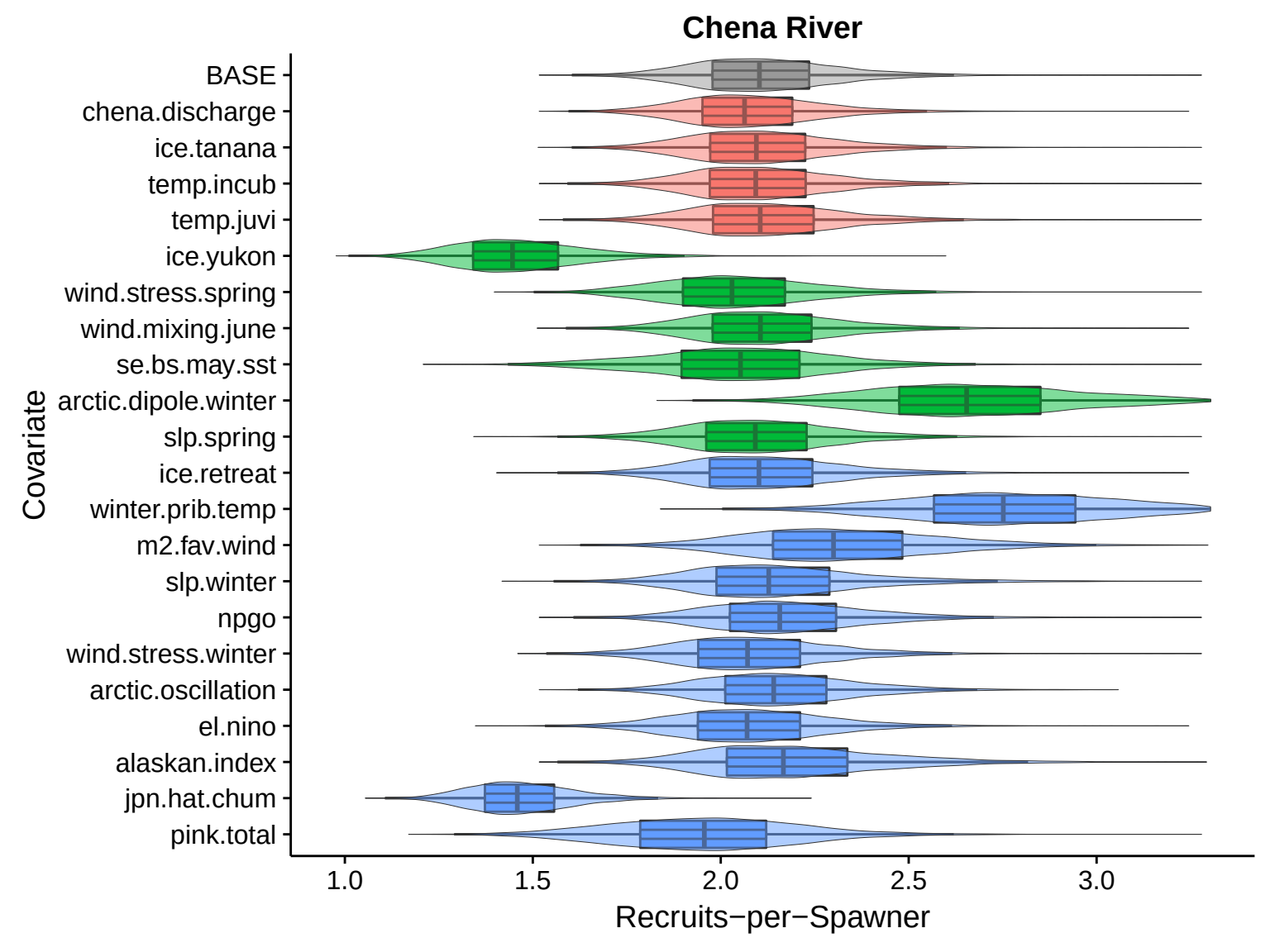

Chena River
chena.discharge
ice.tanana
temp.incub
temp.juvi
ice.yukon
wind.stress.spring
wind.mixing.june
se.bs.may.sst
arctic.dipole.winter
slp.spring
ice.retreat
winter.prib.temp
m2.fav.wind
slp.winter
npgo
wind.stress.winter
arctic.oscillation
el.nino
alaskan.index
jpn.hat.chum
pink.total
Covariate
−50
−25
0
25
50
Percent Difference in Egg−to−Recruit Survival (%)

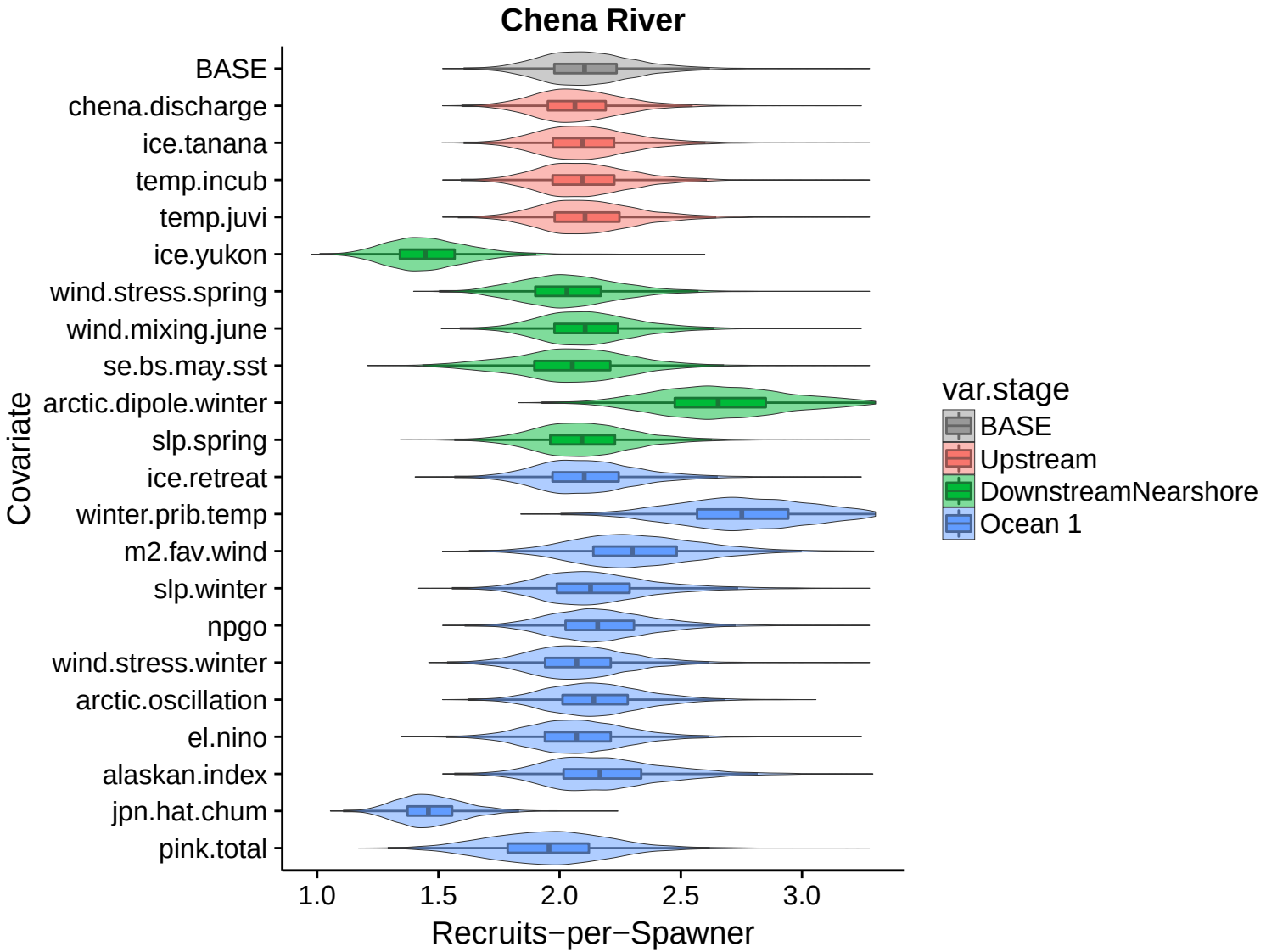

Chena River
chena.discharge
ice.tanana
temp.incub
temp.juvi
ice.yukon
wind.stress.spring
wind.mixing.june
se.bs.may.sst
arctic.dipole.winter
slp.spring
ice.retreat
winter.prib.temp
m2.fav.wind
slp.winter
npgo
wind.stress.winter
arctic.oscillation
el.nino
alaskan.index
jpn.hat.chum
pink.total
Covariate
−50
−25
0
25
50
Percent Difference in Egg−to−Recruit Survival (%)
var.stage
Upstream
DownstreamNearshore
Ocean 1

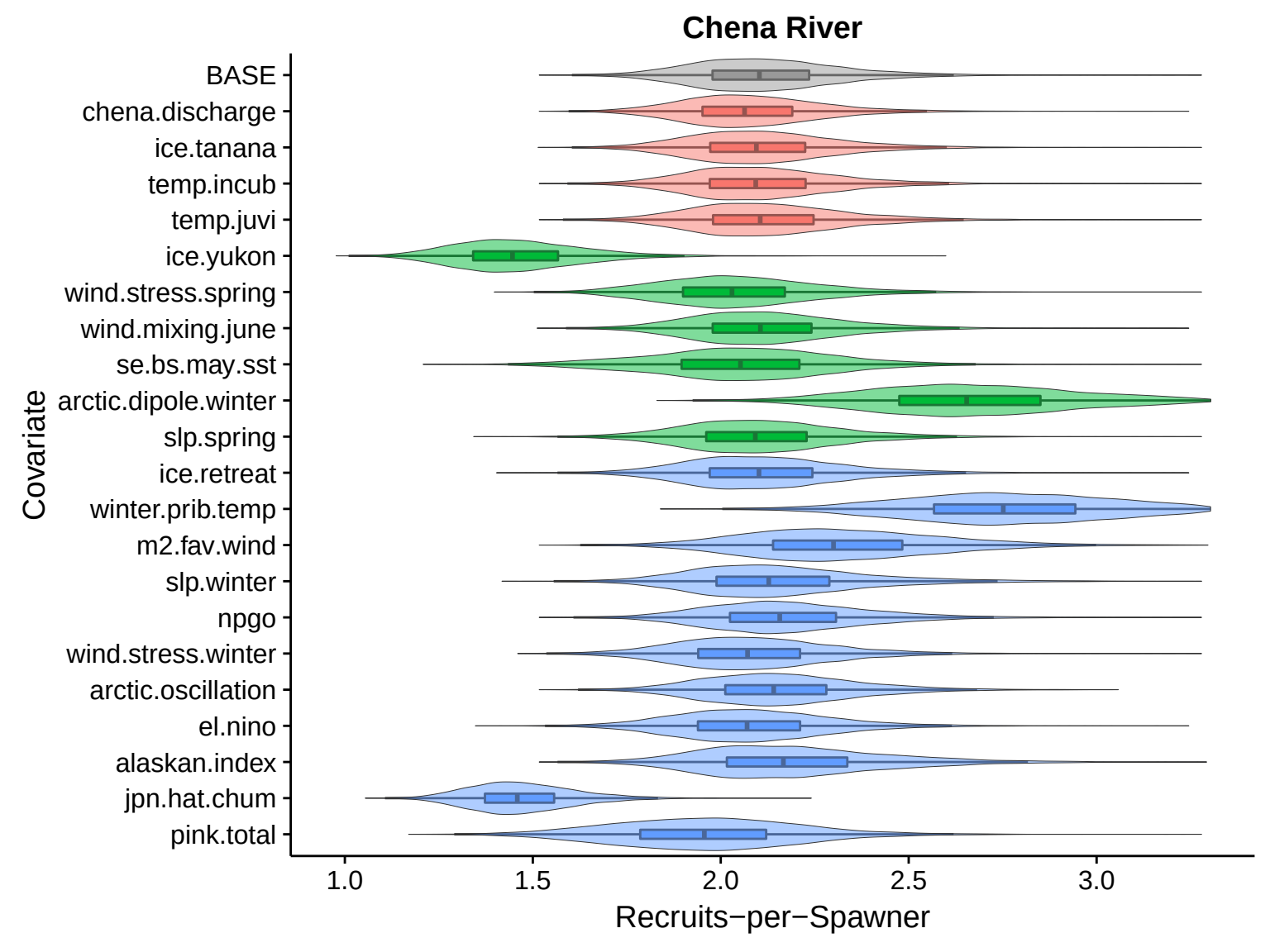

Chena River
chena.discharge
ice.tanana
temp.incub
temp.juvi
ice.yukon
wind.stress.spring
wind.mixing.june
se.bs.may.sst
arctic.dipole.winter
slp.spring
ice.retreat
winter.prib.temp
m2.fav.wind
slp.winter
npgo
wind.stress.winter
arctic.oscillation
el.nino
alaskan.index
jpn.hat.chum
pink.total
Covariate
−50
−25
0
25
50
Percent Difference in Egg−to−Recruit Survival (%)

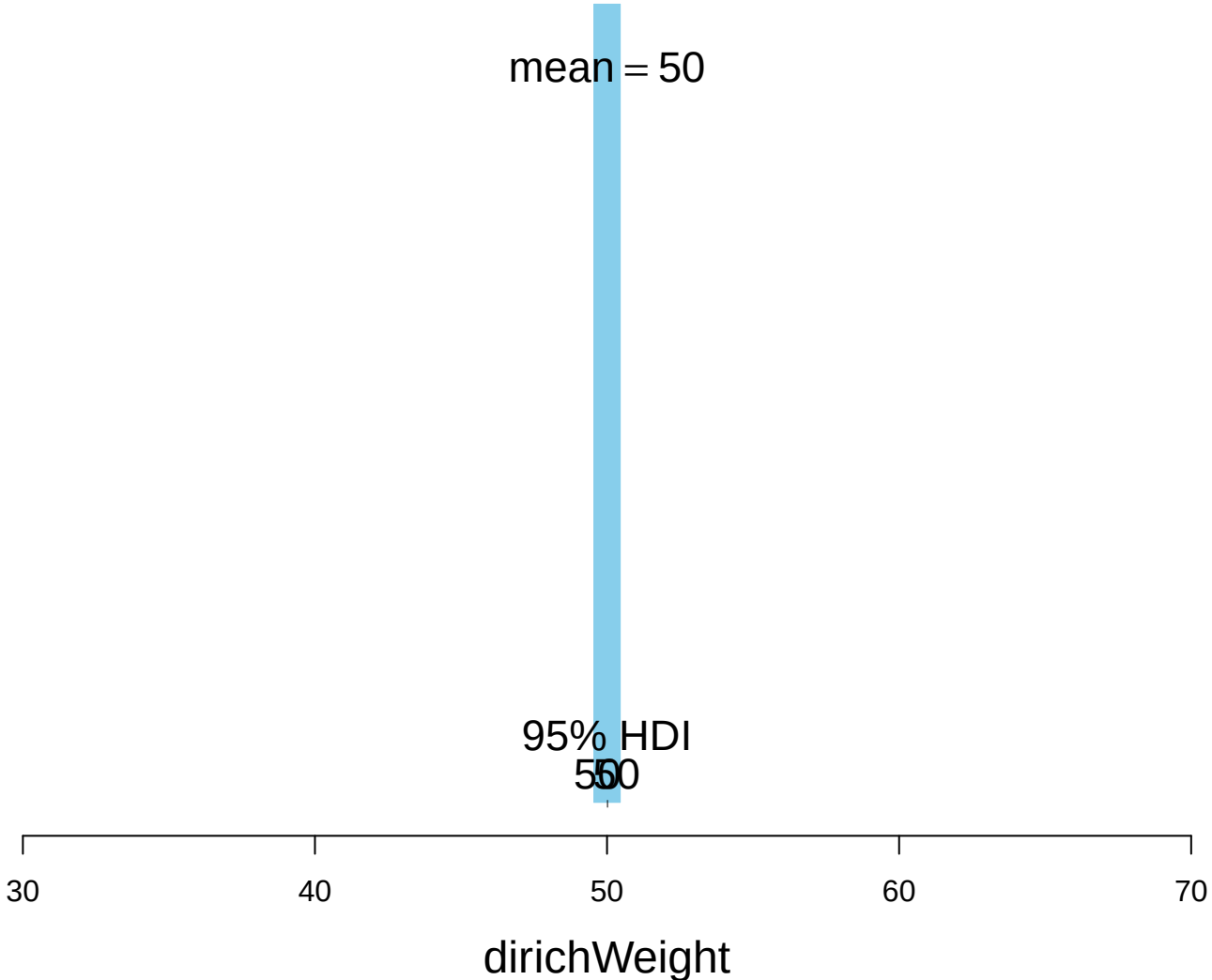

Chena River
BASE
chena.discharge
ice.tanana
temp.incub
temp.juvi
ice.yukon
wind.stress.spring
wind.mixing.june
se.bs.may.sst
arctic.dipole.winter
slp.spring
ice.retreat
winter.prib.temp
m2.fav.wind
slp.winter
npgo
wind.stress.winter
arctic.oscillation
el.nino
alaskan.index
jpn.hat.chum
pink.total
Covariate
1.0
1.5
2.0
2.5
3.0
Recruits−per−Spawner
var.stage
BASE
Upstream
DownstreamNearshore
Ocean 1

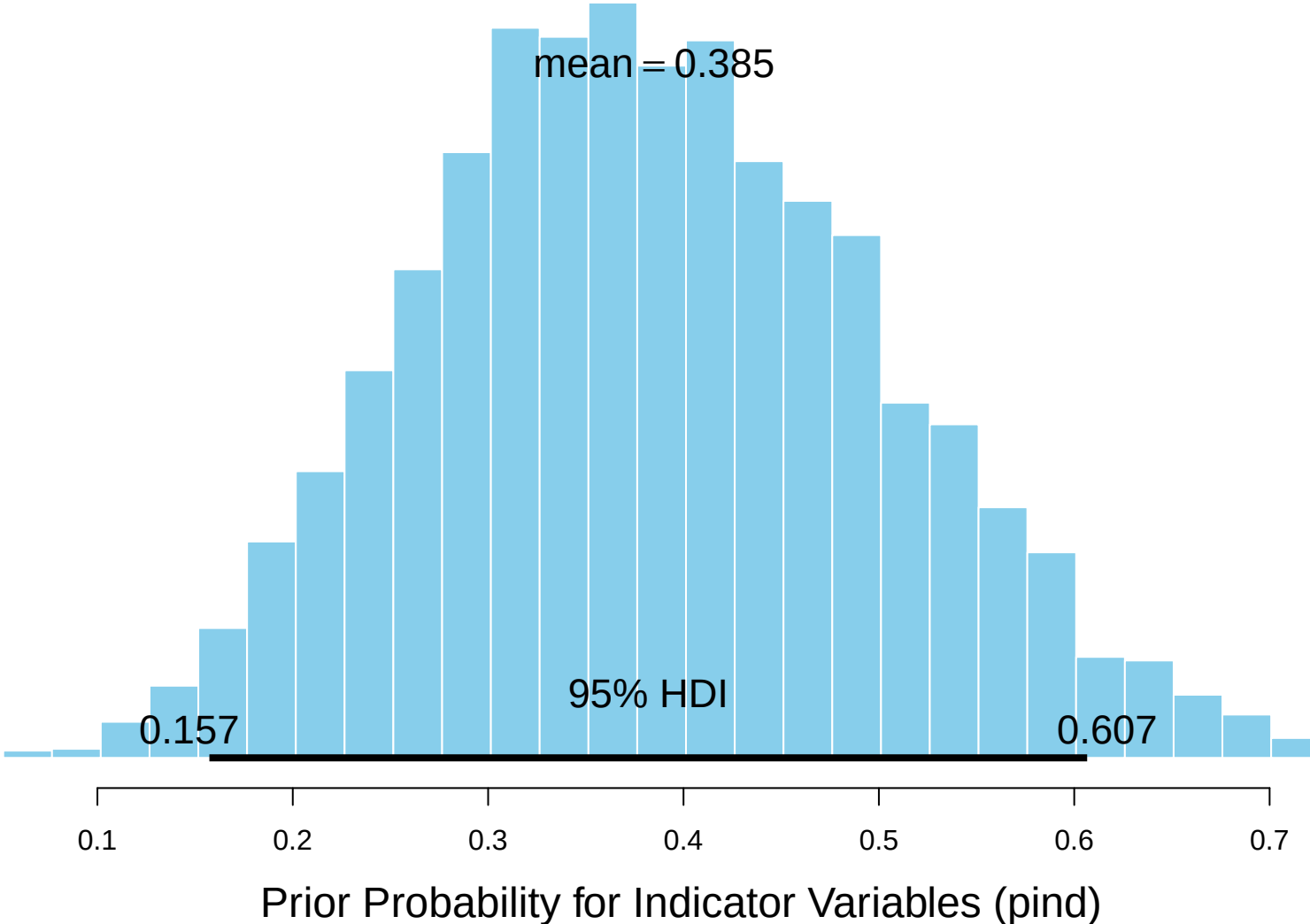

Chena River
BASE
chena.discharge
ice.tanana
temp.incub
temp.juvi
ice.yukon
wind.stress.spring
wind.mixing.june
se.bs.may.sst
arctic.dipole.winter
slp.spring
ice.retreat
winter.prib.temp
m2.fav.wind
slp.winter
npgo
wind.stress.winter
arctic.oscillation
el.nino
alaskan.index
jpn.hat.chum
pink.total
Covariate
1.0
1.5
2.0
2.5
3.0
Recruits−per−Spawner

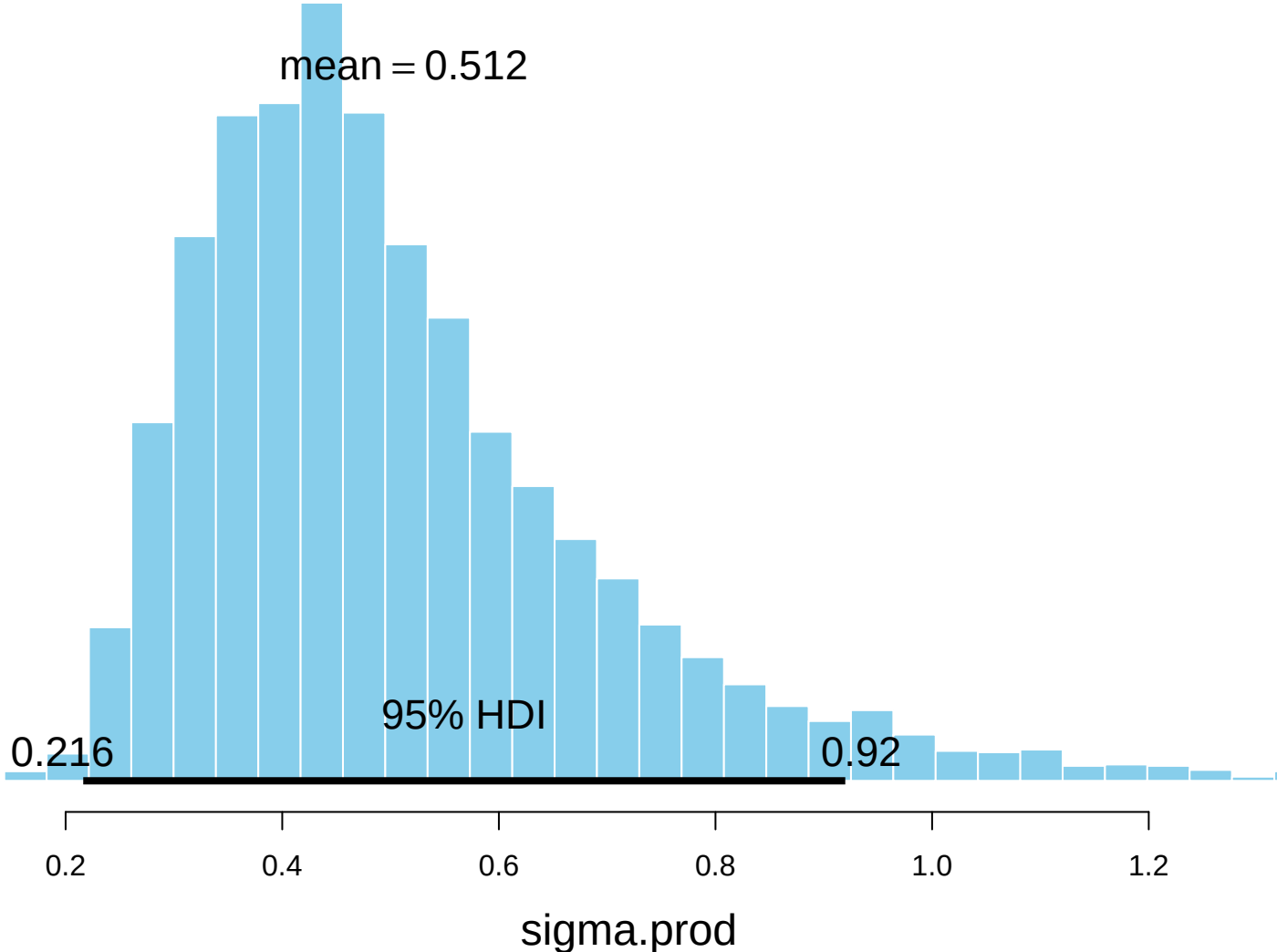

Chena River
BASE
chena.discharge
ice.tanana
temp.incub
temp.juvi
ice.yukon
wind.stress.spring
wind.mixing.june
se.bs.may.sst
arctic.dipole.winter
slp.spring
ice.retreat
winter.prib.temp
m2.fav.wind
slp.winter
npgo
wind.stress.winter
arctic.oscillation
el.nino
alaskan.index
jpn.hat.chum
pink.total
Covariate
1.0
1.5
2.0
2.5
3.0
Recruits−per−Spawner

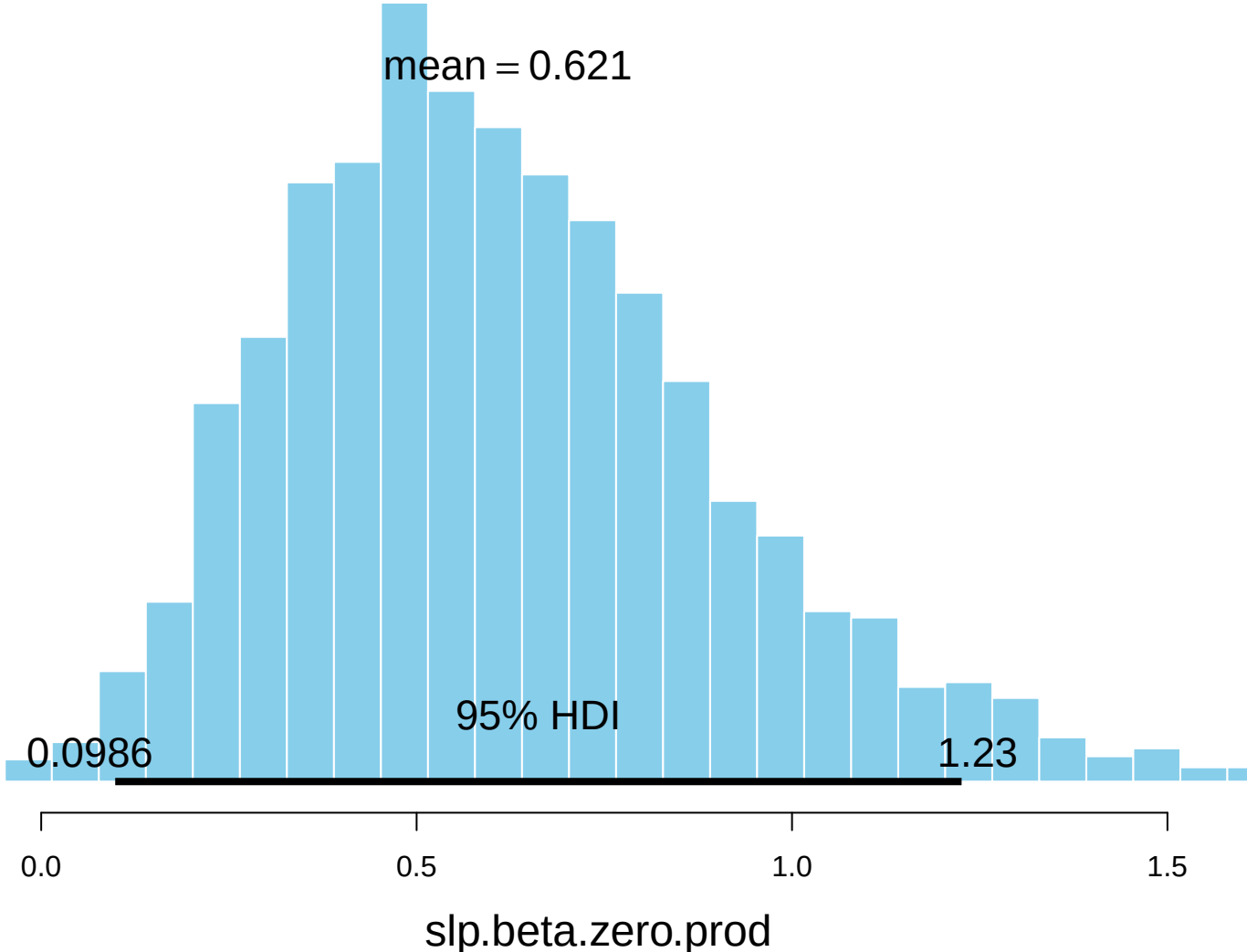

Chena River
BASE
chena.discharge
ice.tanana
temp.incub
temp.juvi
ice.yukon
wind.stress.spring
wind.mixing.june
se.bs.may.sst
arctic.dipole.winter
slp.spring
ice.retreat
winter.prib.temp
m2.fav.wind
slp.winter
npgo
wind.stress.winter
arctic.oscillation
el.nino
alaskan.index
jpn.hat.chum
pink.total
Covariate
1.0
1.5
2.0
2.5
3.0
Recruits−per−Spawner
var.stage
BASE
Upstream
DownstreamNearshore
Ocean 1

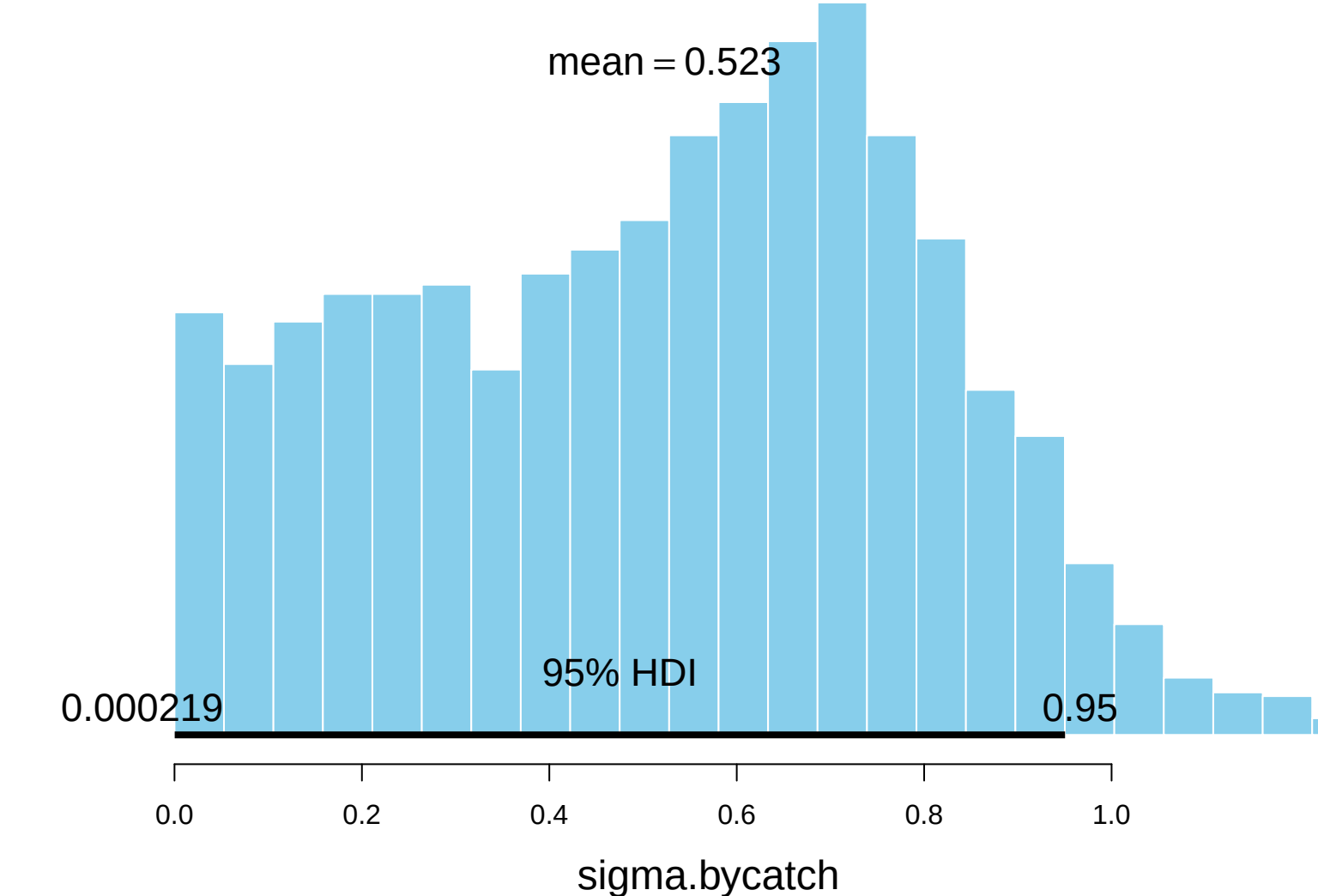

Chena River
BASE
chena.discharge
ice.tanana
temp.incub
temp.juvi
ice.yukon
wind.stress.spring
wind.mixing.june
se.bs.may.sst
arctic.dipole.winter
slp.spring
ice.retreat
winter.prib.temp
m2.fav.wind
slp.winter
npgo
wind.stress.winter
arctic.oscillation
el.nino
alaskan.index
jpn.hat.chum
pink.total
Covariate
1.0
1.5
2.0
2.5
3.0
Recruits−per−Spawner

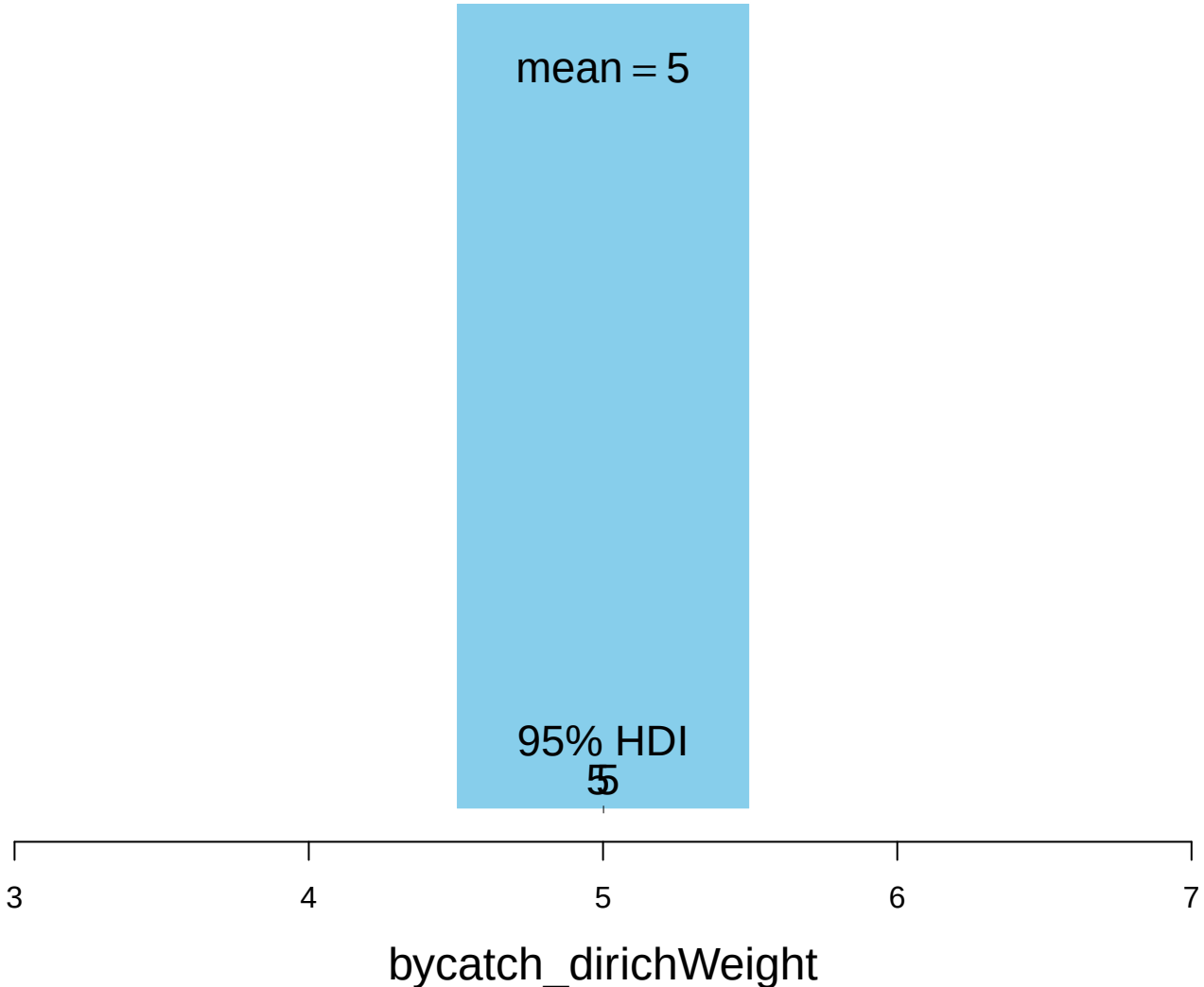

mean = 50
95% HDI
50
30
40
50
60
70
dirichWeight

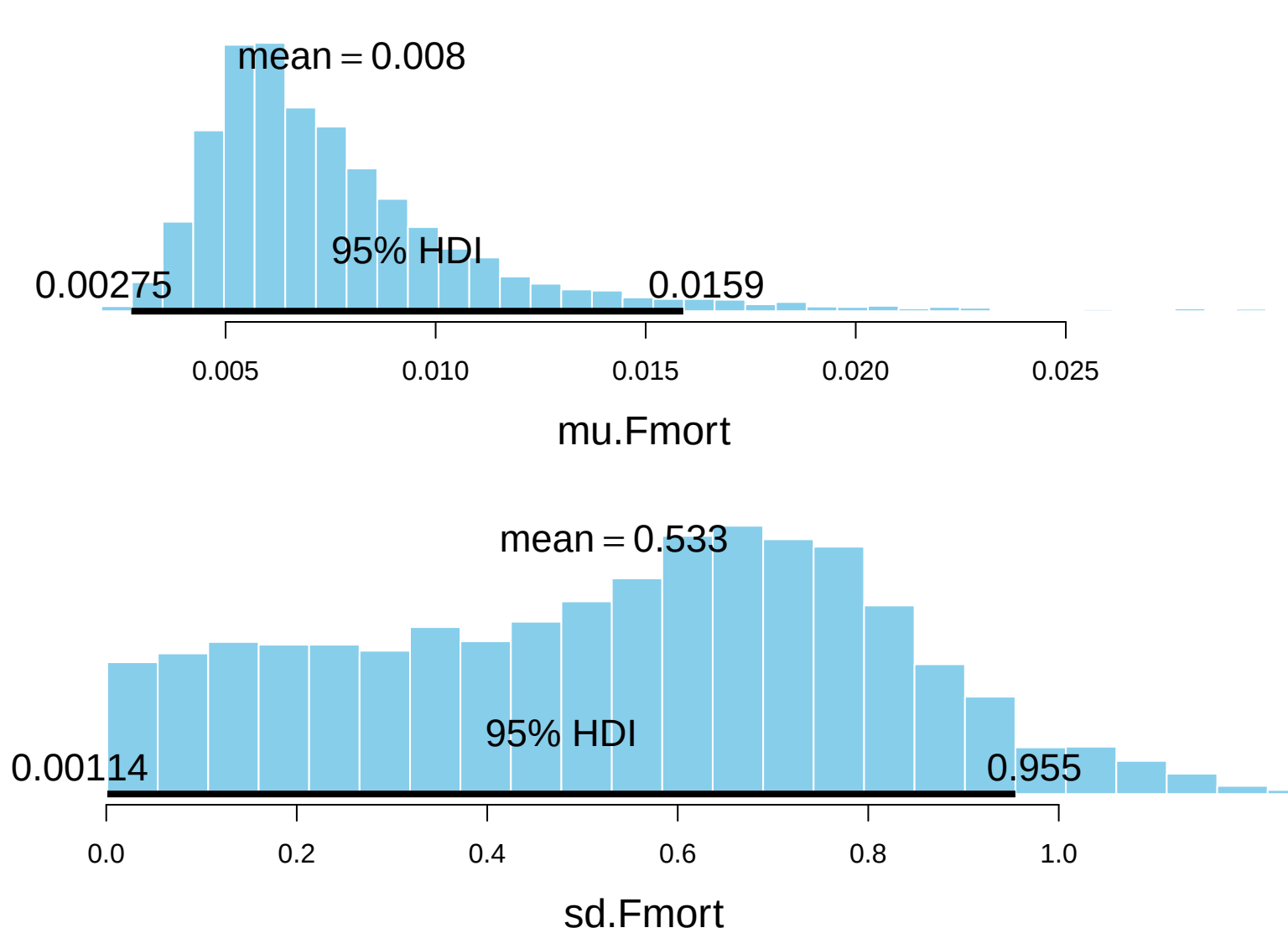

mean = 0.385
95% HDI
0.157
0.607
0.1
0.2
0.3
0.4
0.5
0.6
0.7
Prior Probability for Indicator Variables (pind)

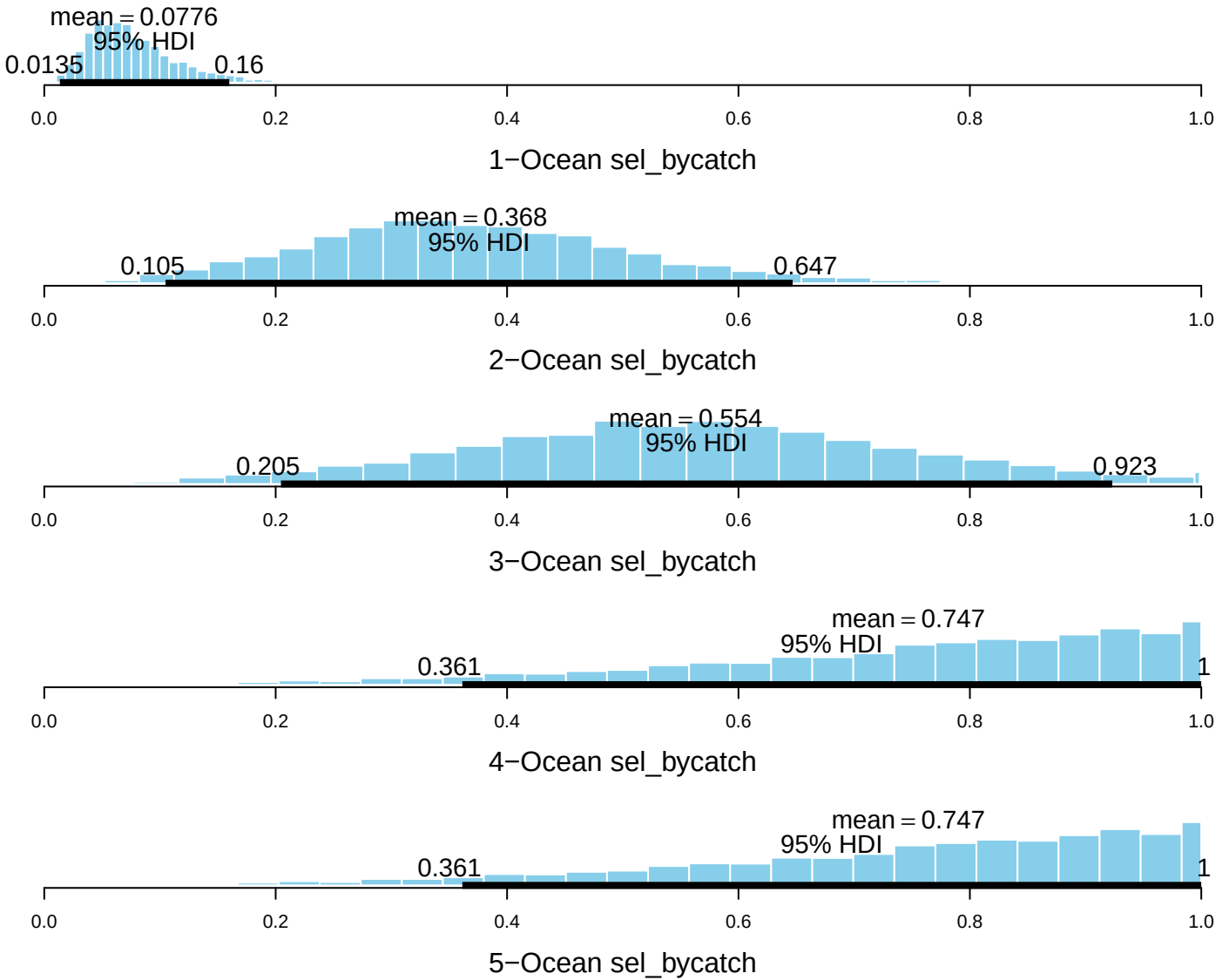

mean = 0.512
95% HDI
0.216
0.92
0.2
0.4
0.6
0.8
1.0
1.2
sigma.prod

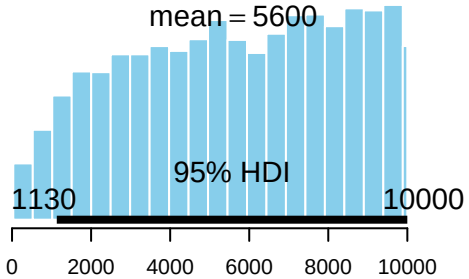

mean = 0.621
95% HDI
0.0986
1.23
0.0
0.5
1.0
1.5
slp.beta.zero.prod


mean = 0.523
95% HDI
0.000219
0.95
0.0
0.2
0.4
0.6
0.8
1.0
sigma.bycatch

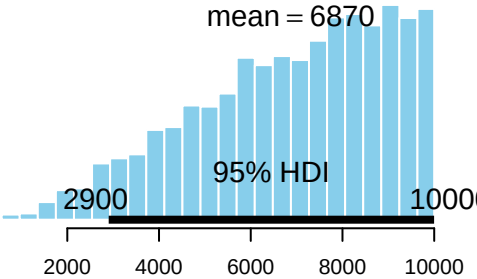

mean = 5
95% HDI
5
5
3
4
5
6
7
bycatch_dirichWeight


mean = 0.008
95% HDI
0.00275
0.0159
0.005
0.010
0.015
0.020
0.025
mu.Fmort
mean = 0.533
95% HDI
0.00114
0.955
0.0
0.2
0.4
0.6
0.8
1.0
sd.Fmort

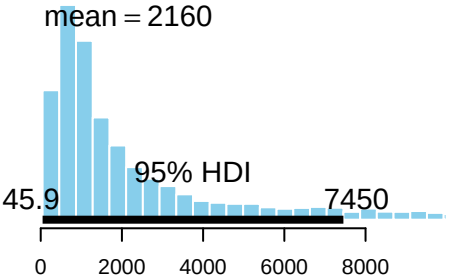

mean = 0.0776
95% HDI
0.0135
0.16
0.0
0.2
0.4
0.6
0.8
1.0
1−Ocean sel_bycatch
mean = 0.368
95% HDI
0.105
0.647
0.0
0.2
0.4
0.6
0.8
1.0
2−Ocean sel_bycatch
mean = 0.554
95% HDI
0.205
0.923
0.0
0.2
0.4
0.6
0.8
1.0
3−Ocean sel_bycatch
mean = 0.747
95% HDI
0.361
1
0.0
0.2
0.4
0.6
0.8
1.0
4−Ocean sel_bycatch
mean = 0.747
95% HDI
0.361
1
0.0
0.2
0.4
0.6
0.8
1.0
5−Ocean sel_bycatch



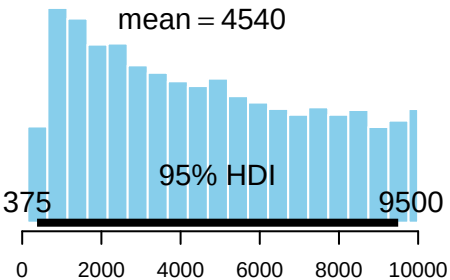
Init Year: 1980



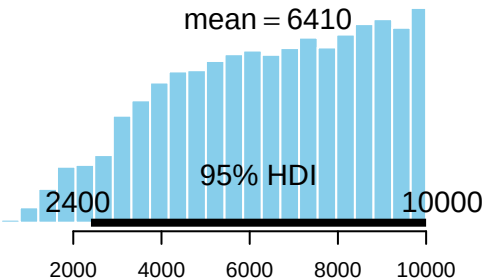
Init Year: 1981



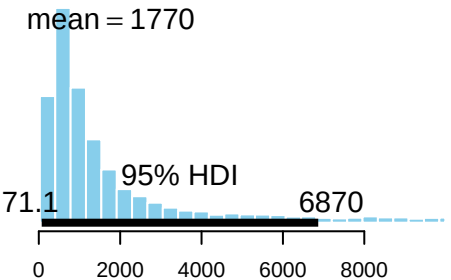
Init Year: 1982



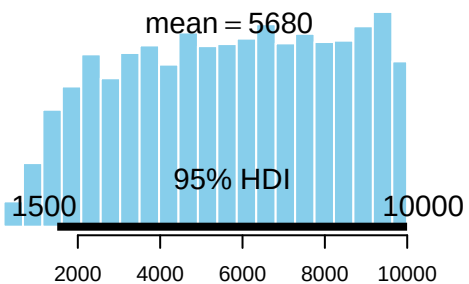
Init Year: 1983



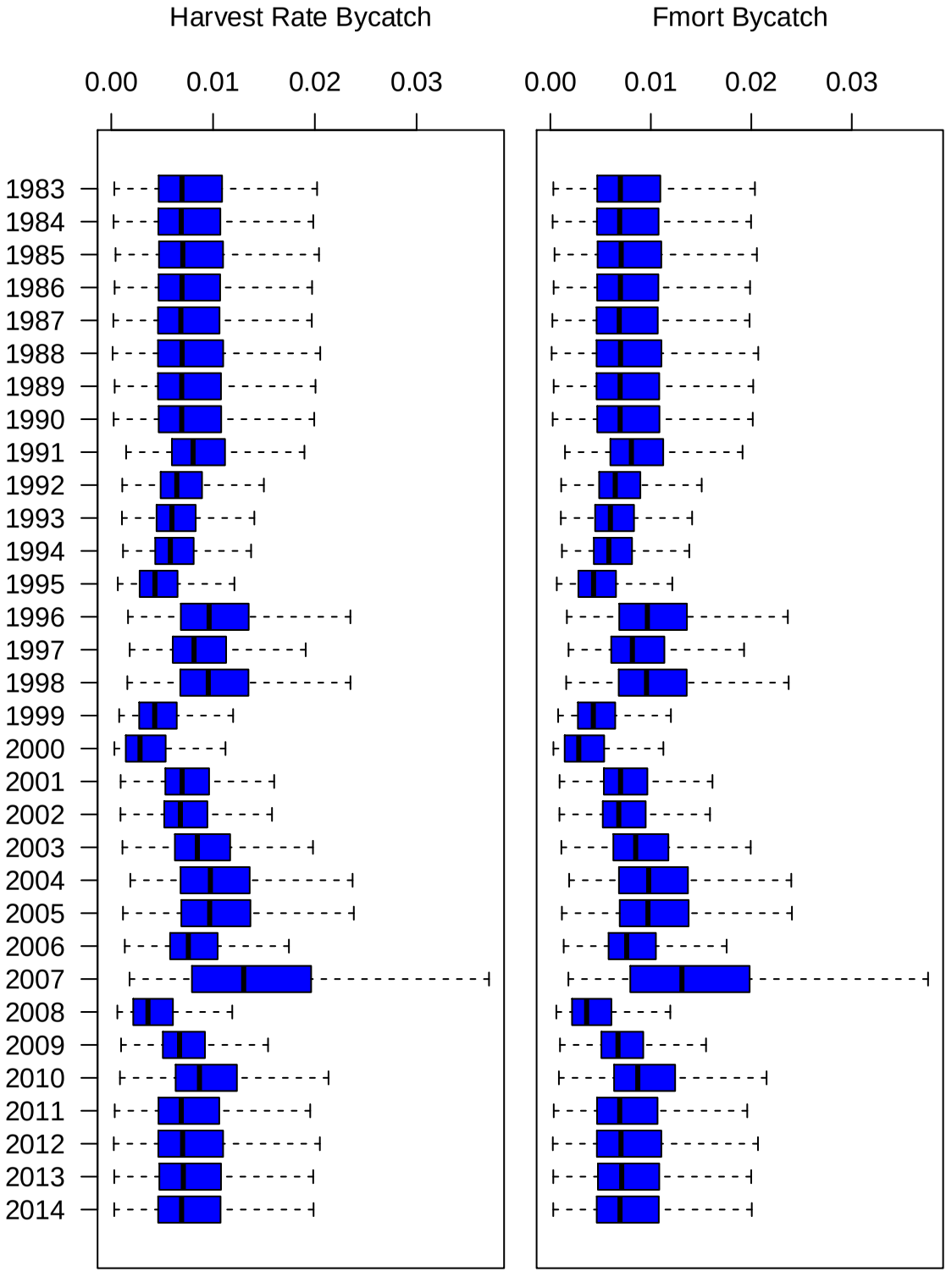
Init Year: 1984

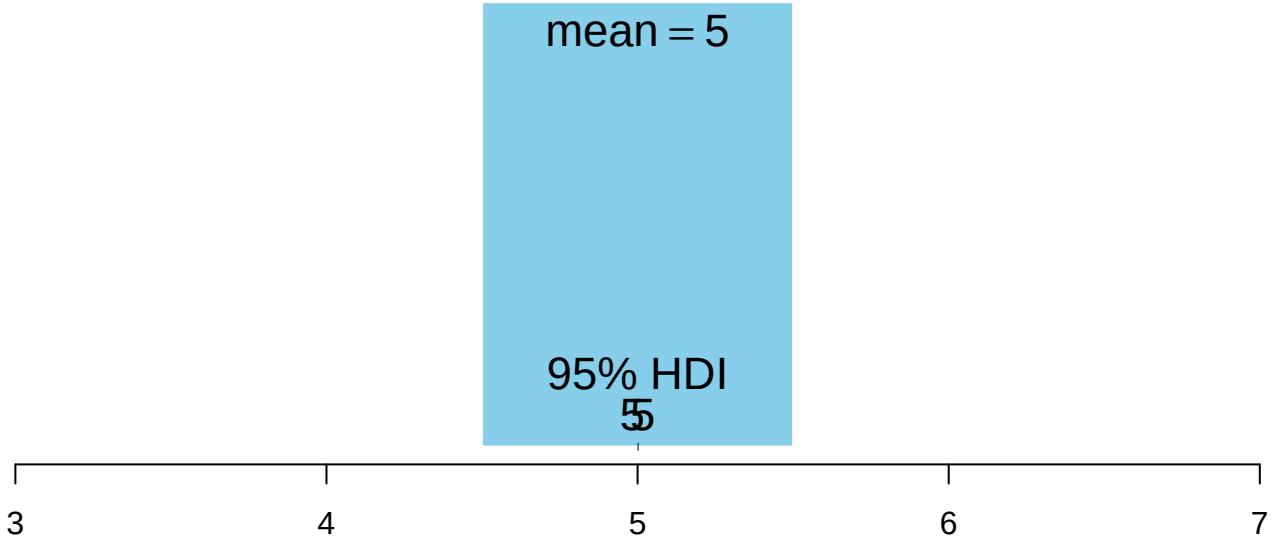


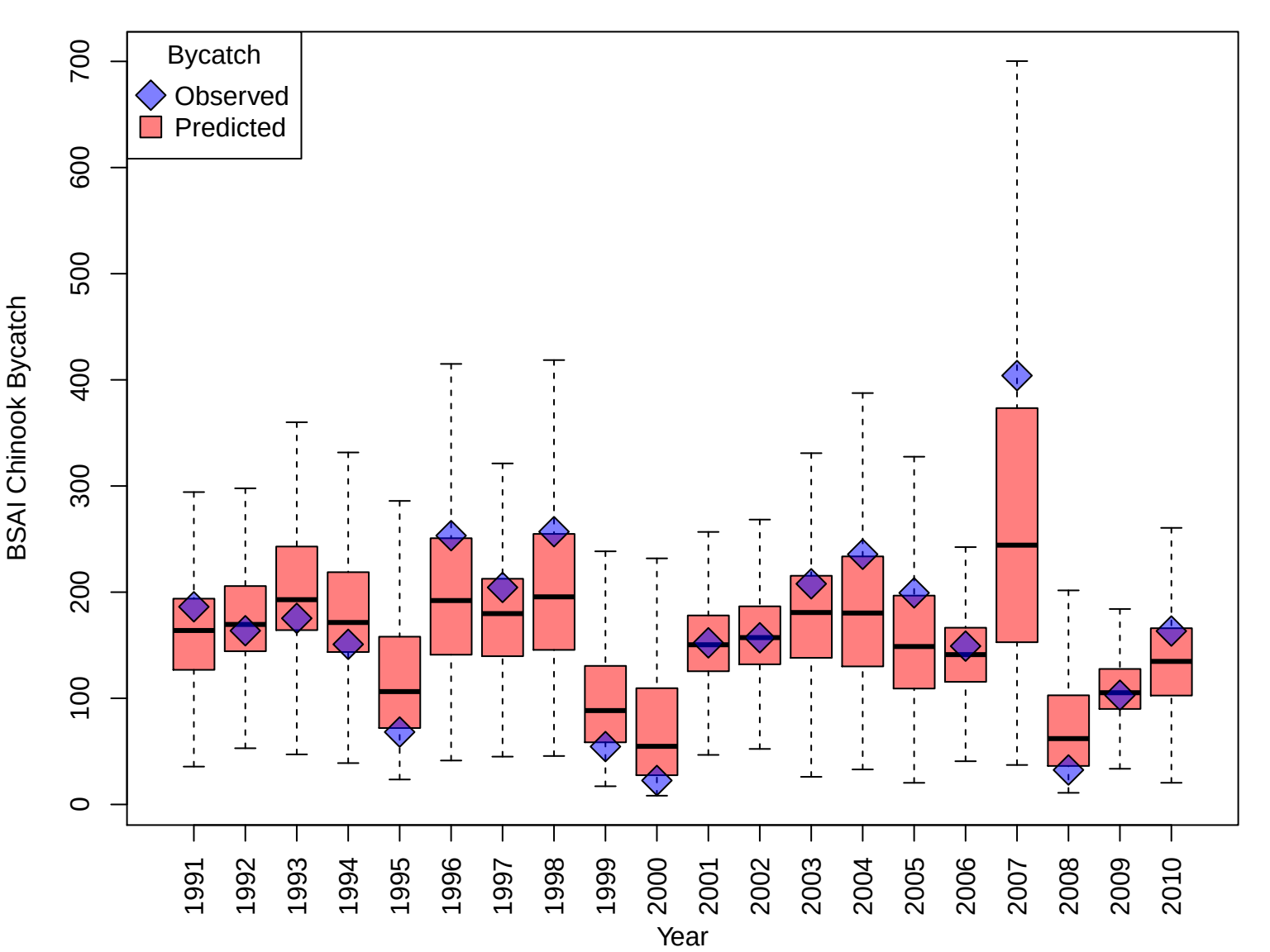
Init Year: 1985

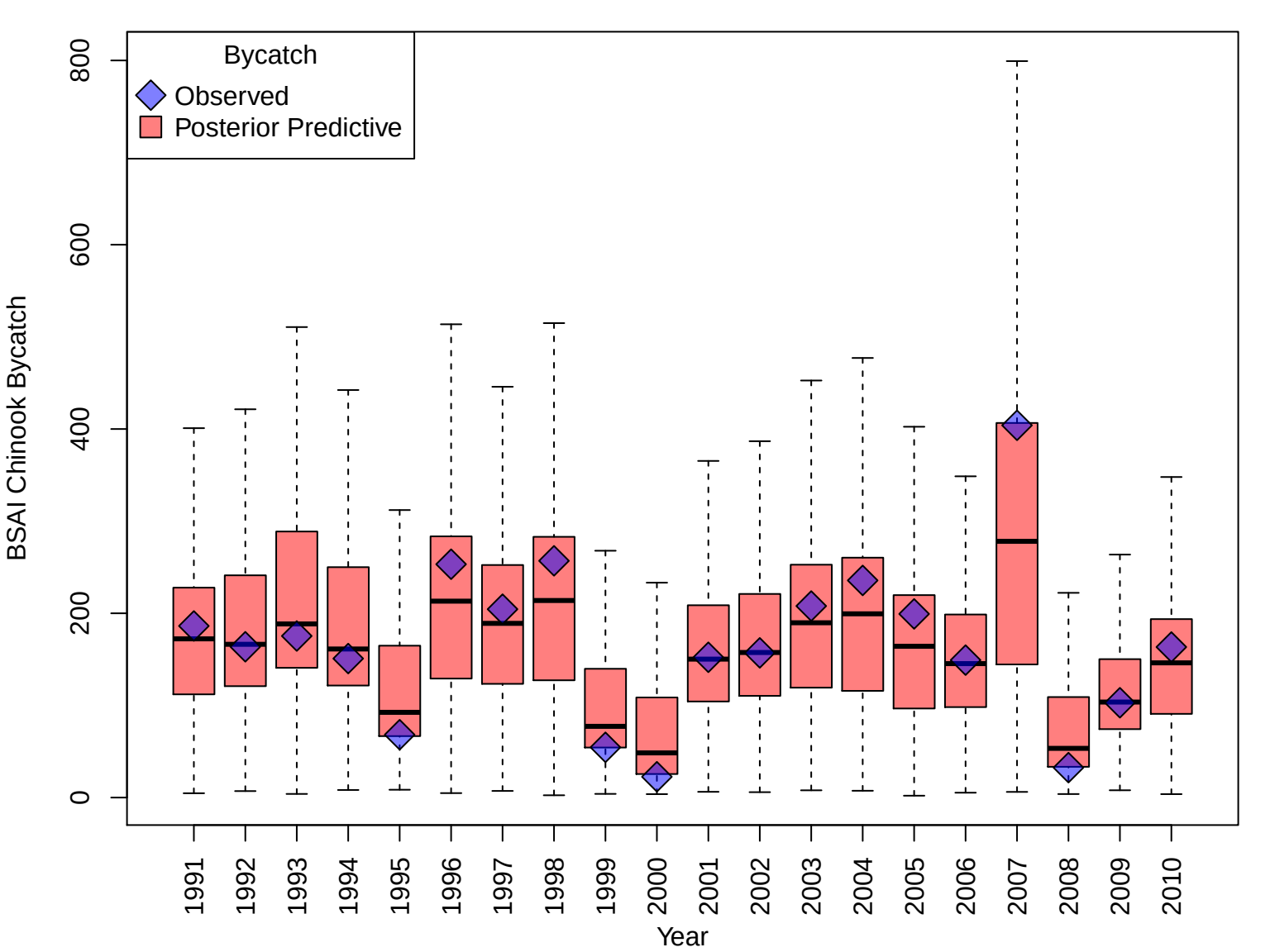


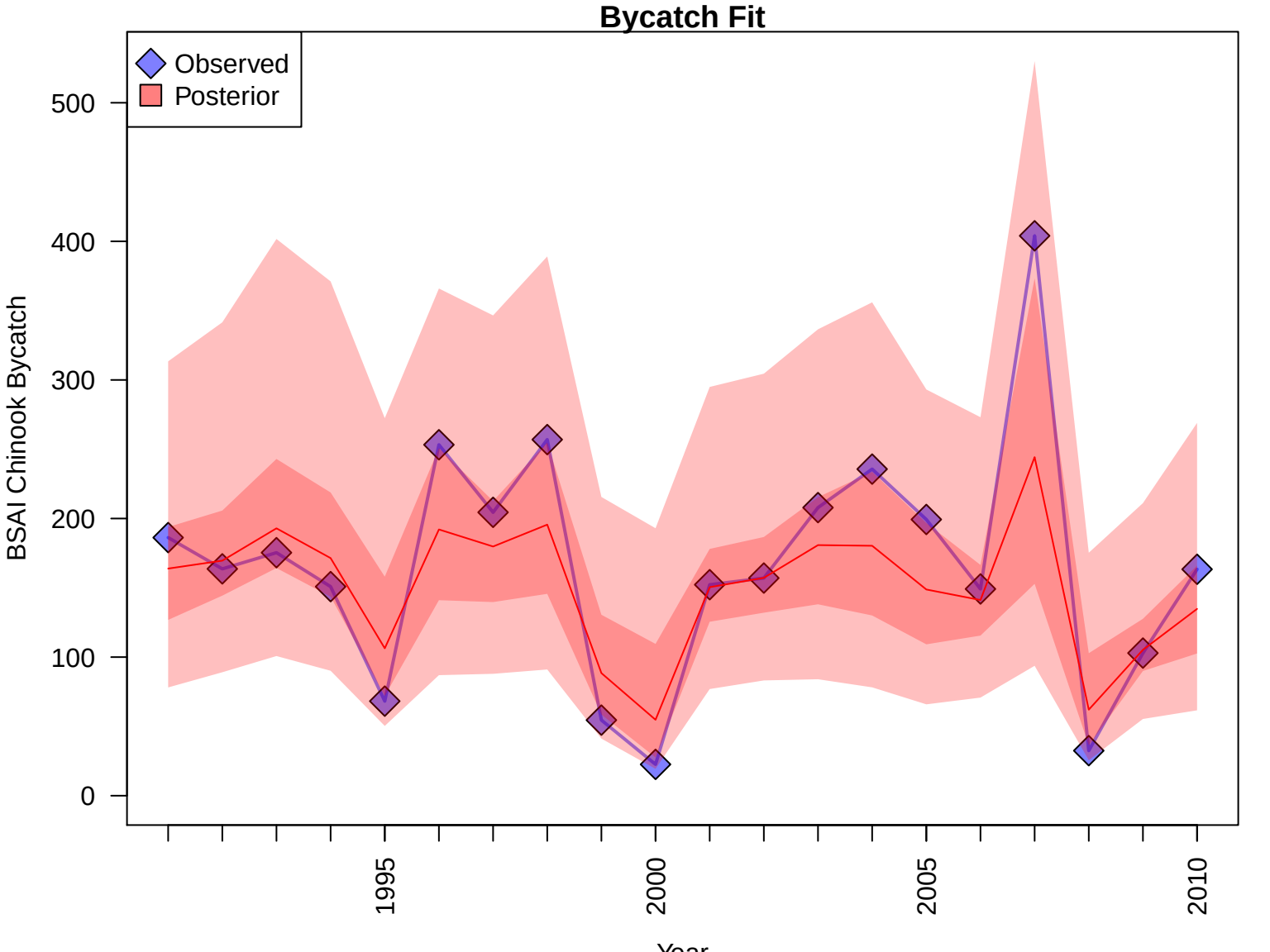
Init Year: 1986

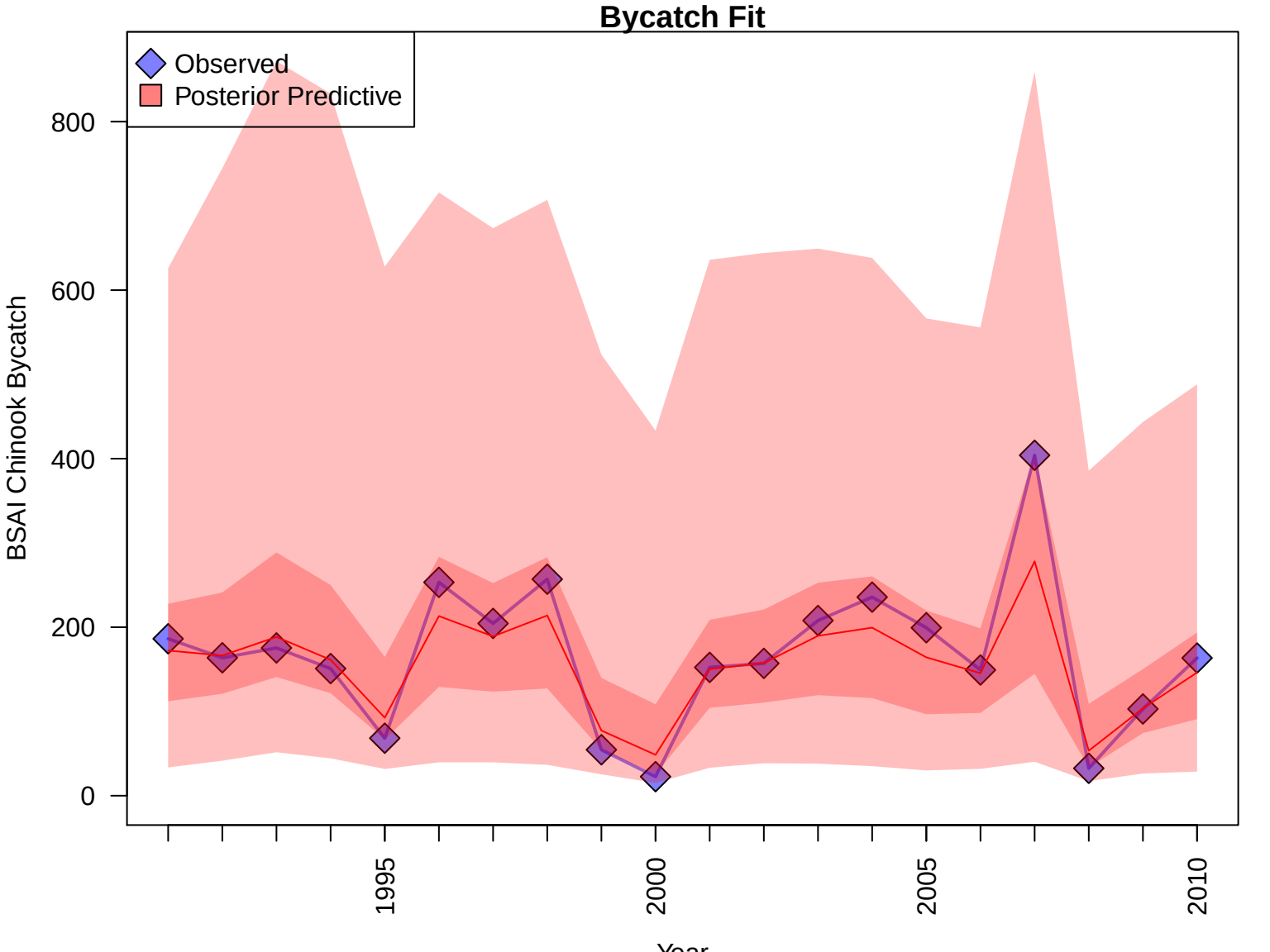

Harvest Rate Bycatch
Fmort Bycatch
0.00
0.01
0.02
0.03
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014

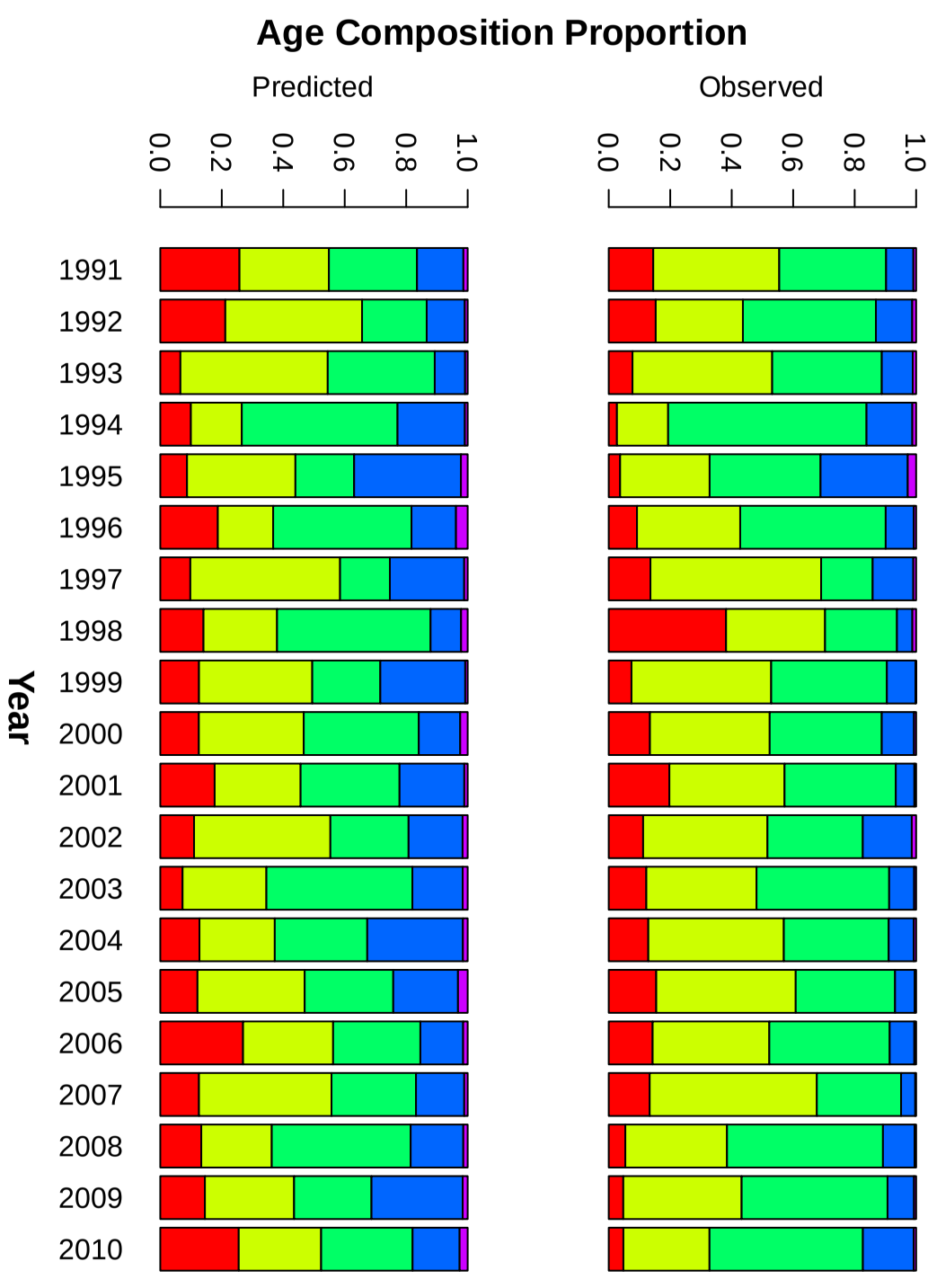

mean = 5
95% HDI
5
3
4
5
6
7

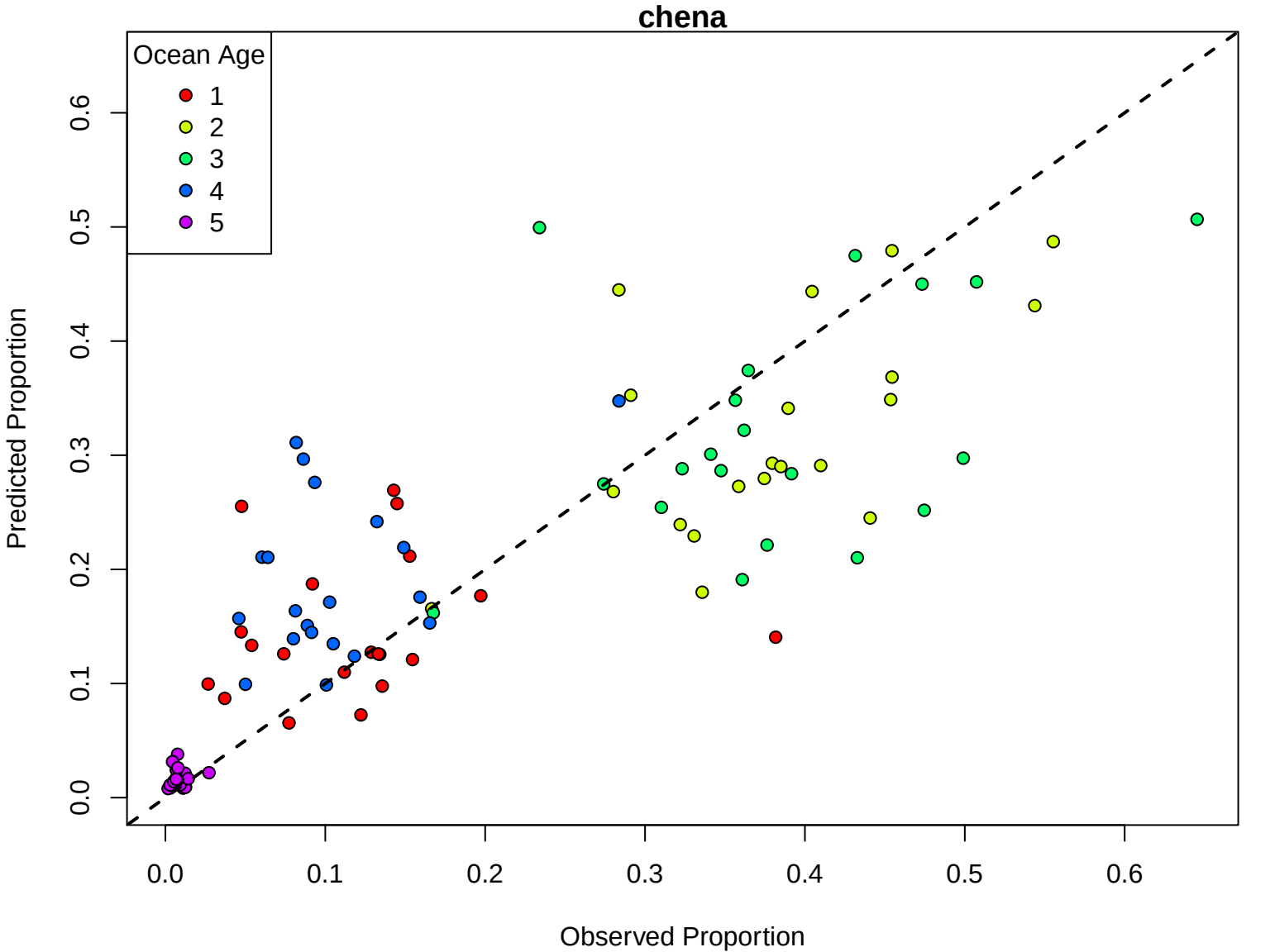

Bycatch
Observed
Predicted
BSAI Chinook Bycatch
0
100
200
300
400
500
600
700
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Year

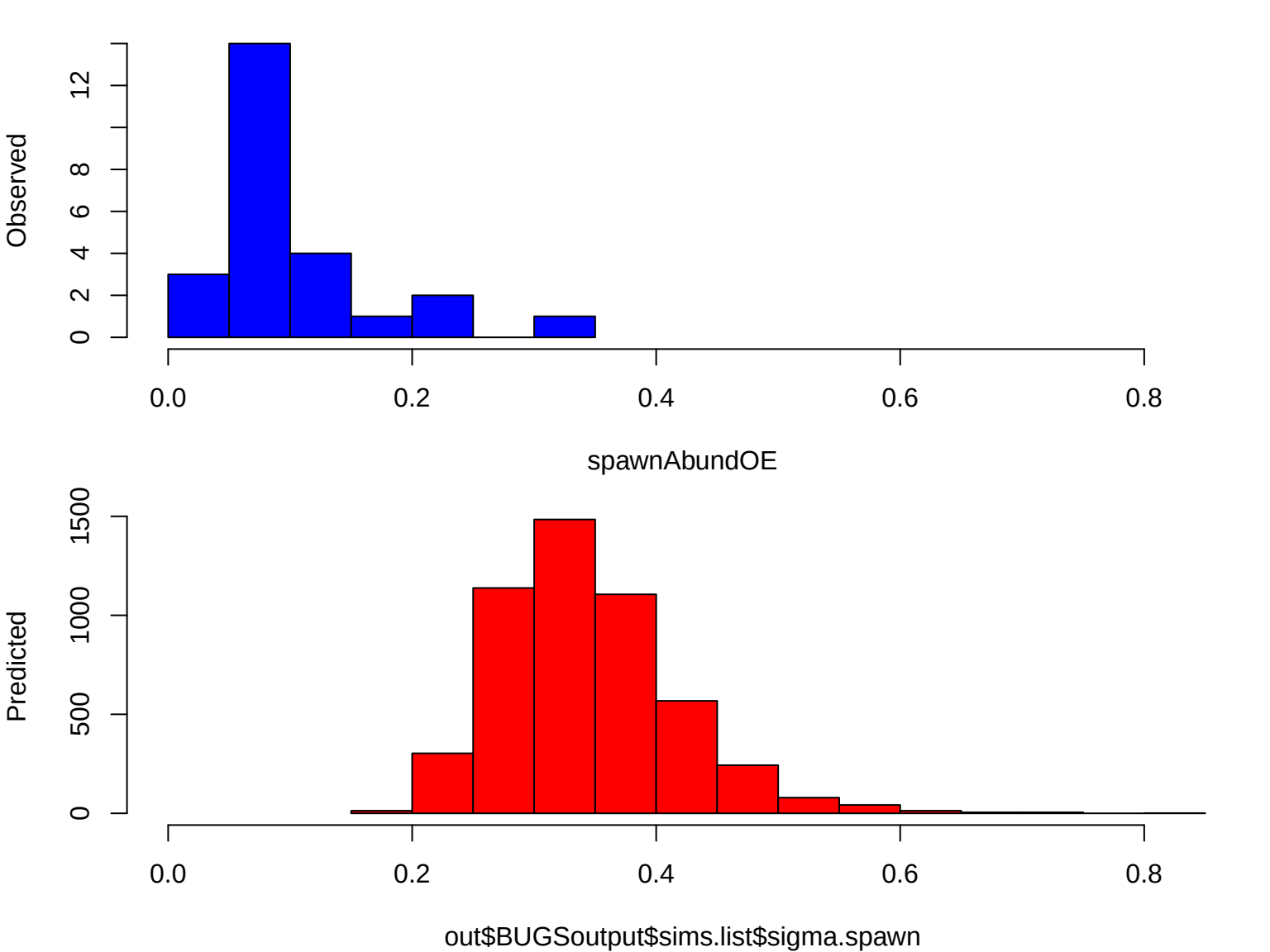

Bycatch
Observed
Posterior Predictive
BSAI Chinook Bycatch
0
200
400
600
800
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Year

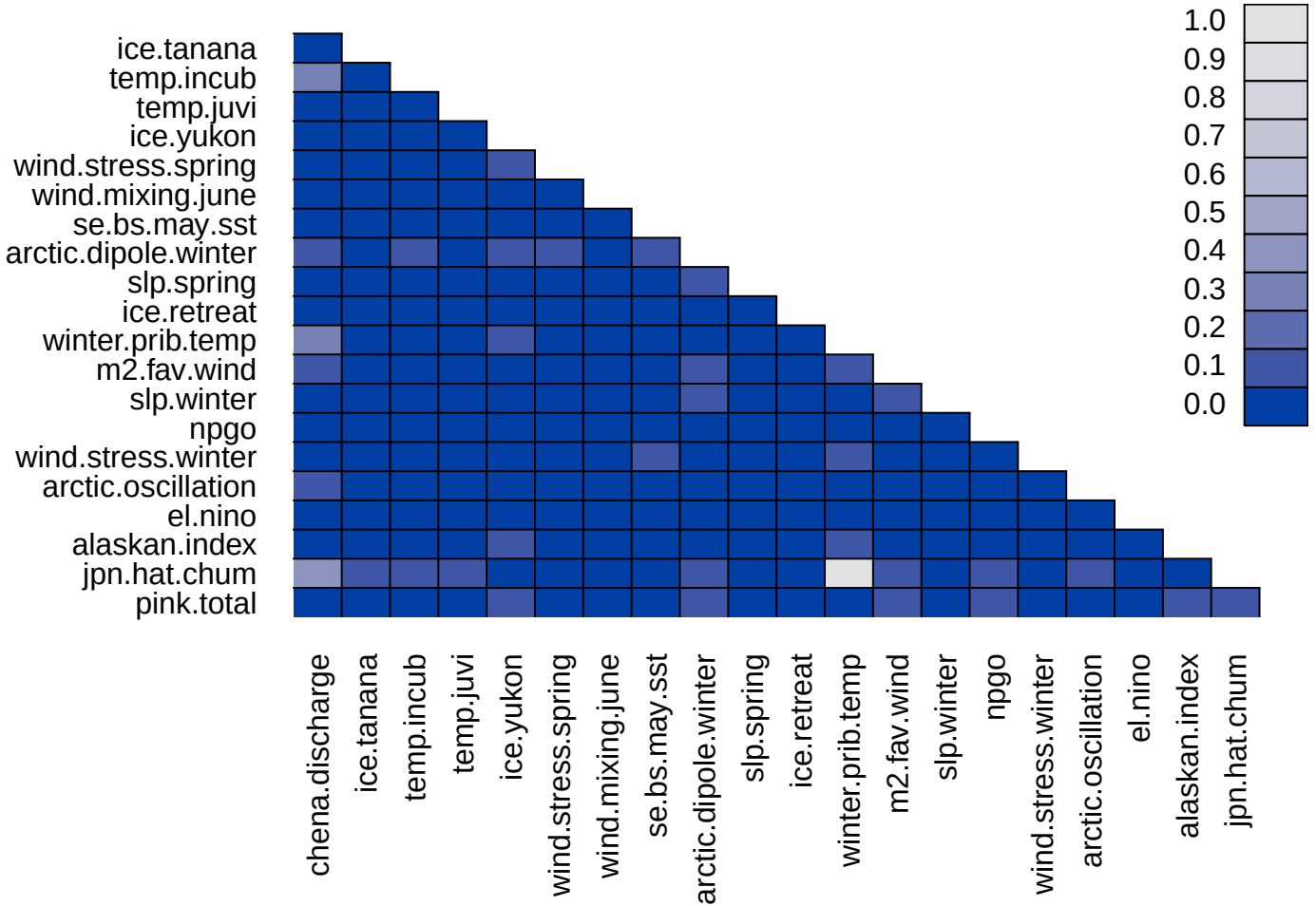

Bycatch Fit
Observed
Posterior
BSAI Chinook Bycatch
0
100
200
300
400
500
1995
2000
2005
2010
Year


Bycatch Fit
Observed
Posterior Predictive
800
600
400
200
0
BSAI Chinook Bycatch
1995
2000
2005
2010
Year


Age Composition Proportion
Predicted
Observed
0.0
0.2
0.4
0.6
0.8
1.0
Year
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010


chena
Ocean Age
1
2
3
4
5
Predicted Proportion
Observed Proportion
0.0
0.1
0.2
0.3
0.4
0.5
0.6


Observed
0
2
4
6
8
12
0.0
0.2
0.4
0.6
0.8
spawnAbundOE
Predicted
0
500
1000
1500
0.0
0.2
0.4
0.6
0.8
out$BUGSoutput$sims.list$sigma.spawn


ice.tanana
temp.incub
temp.juvi
ice.yukon
wind.stress.spring
wind.mixing.june
se.bs.may.sst
arctic.dipole.winter
slp.spring
ice.retreat
winter.prib.temp
m2.fav.wind
slp.winter
npgo
wind.stress.winter
arctic.oscillation
el.nino
alaskan.index
jpn.hat.chum
pink.total
chena.discharge
ice.tanana
temp.incub
temp.juvi
ice.yukon
wind.stress.spring
wind.mixing.june
se.bs.may.sst
arctic.dipole.winter
slp.spring
ice.retreat
winter.prib.temp
m2.fav.wind
slp.winter
npgo
wind.stress.winter
arctic.oscillation
el.nino
alaskan.index
jpn.hat.chum
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0