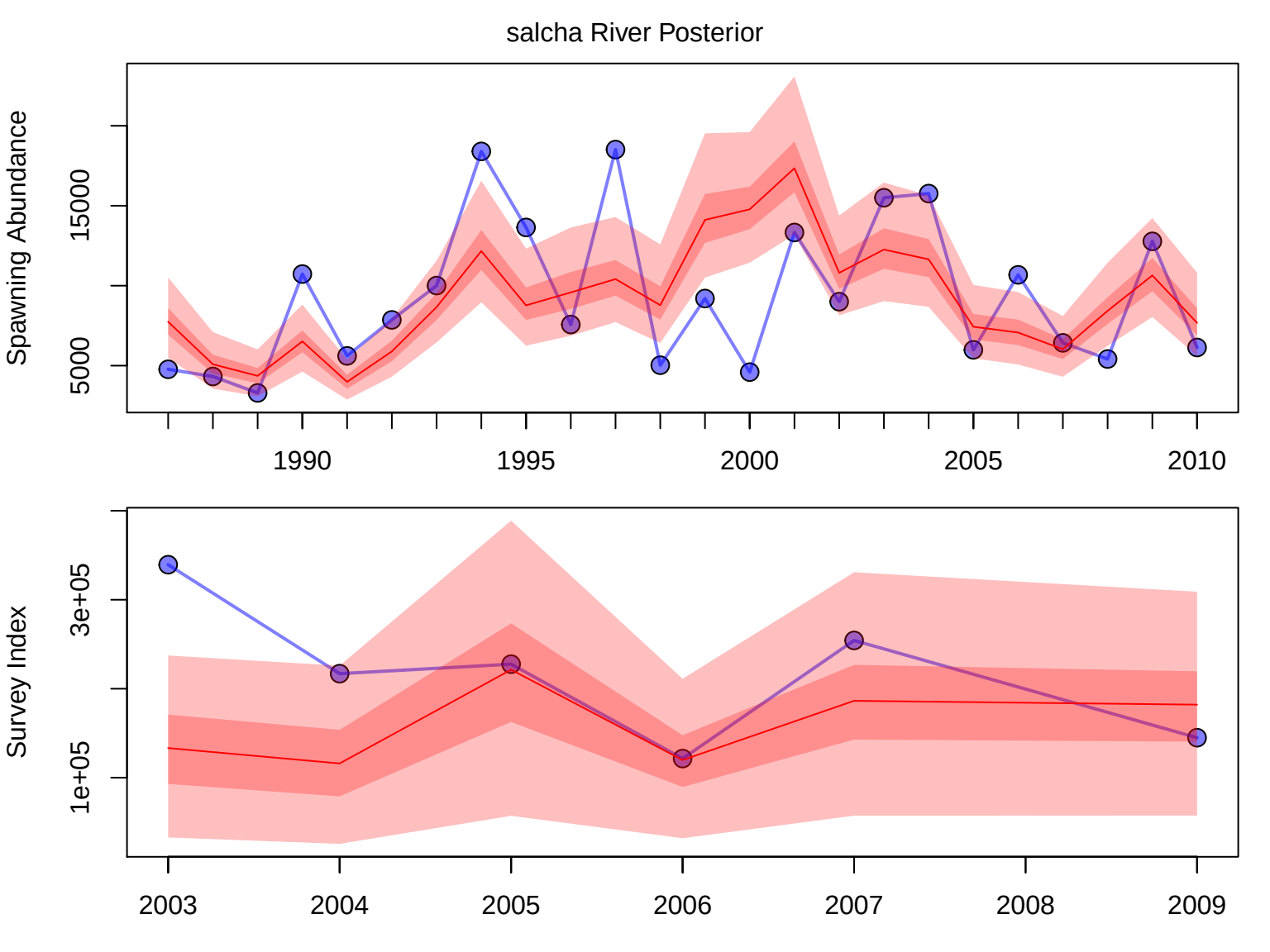
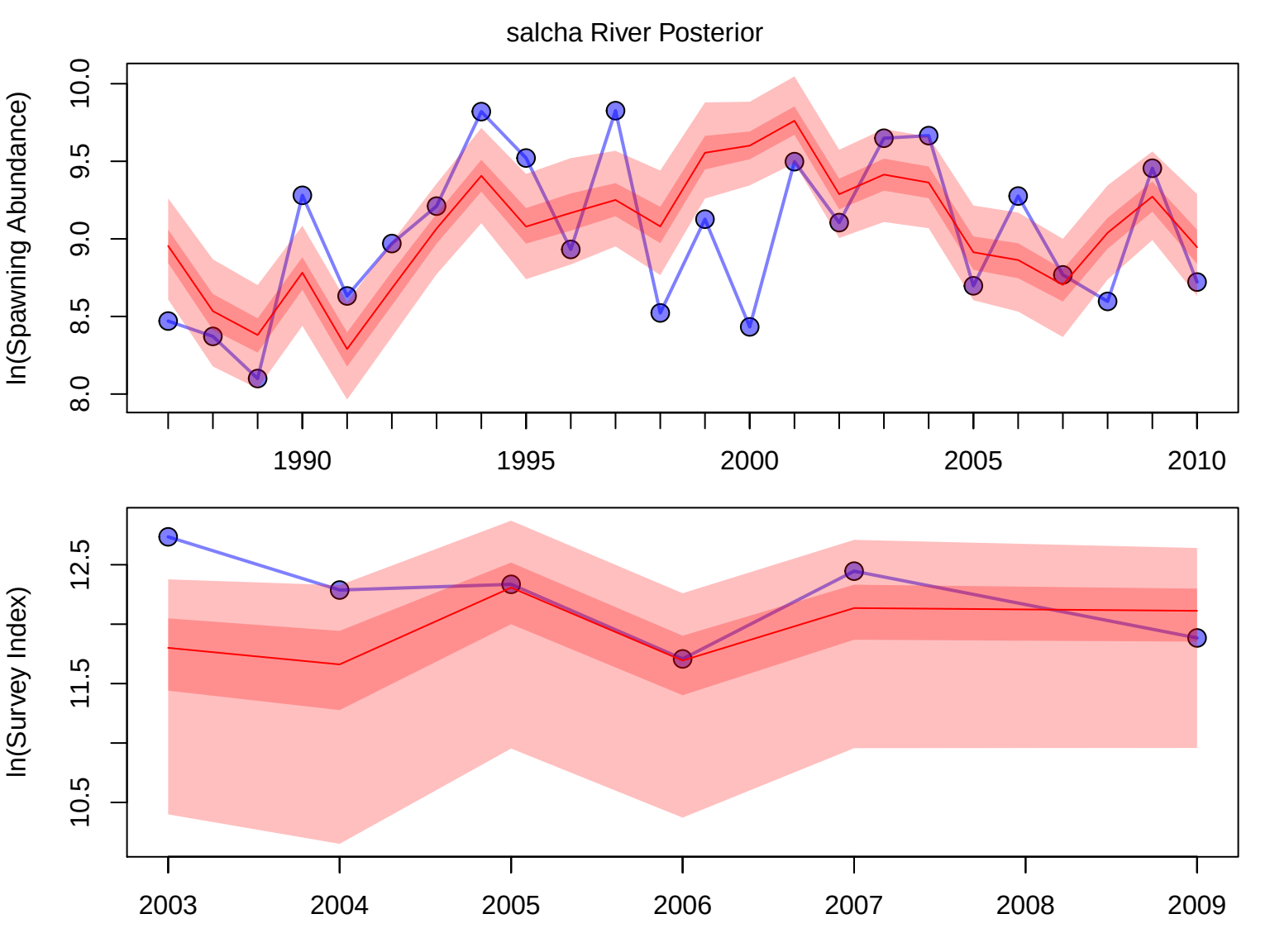
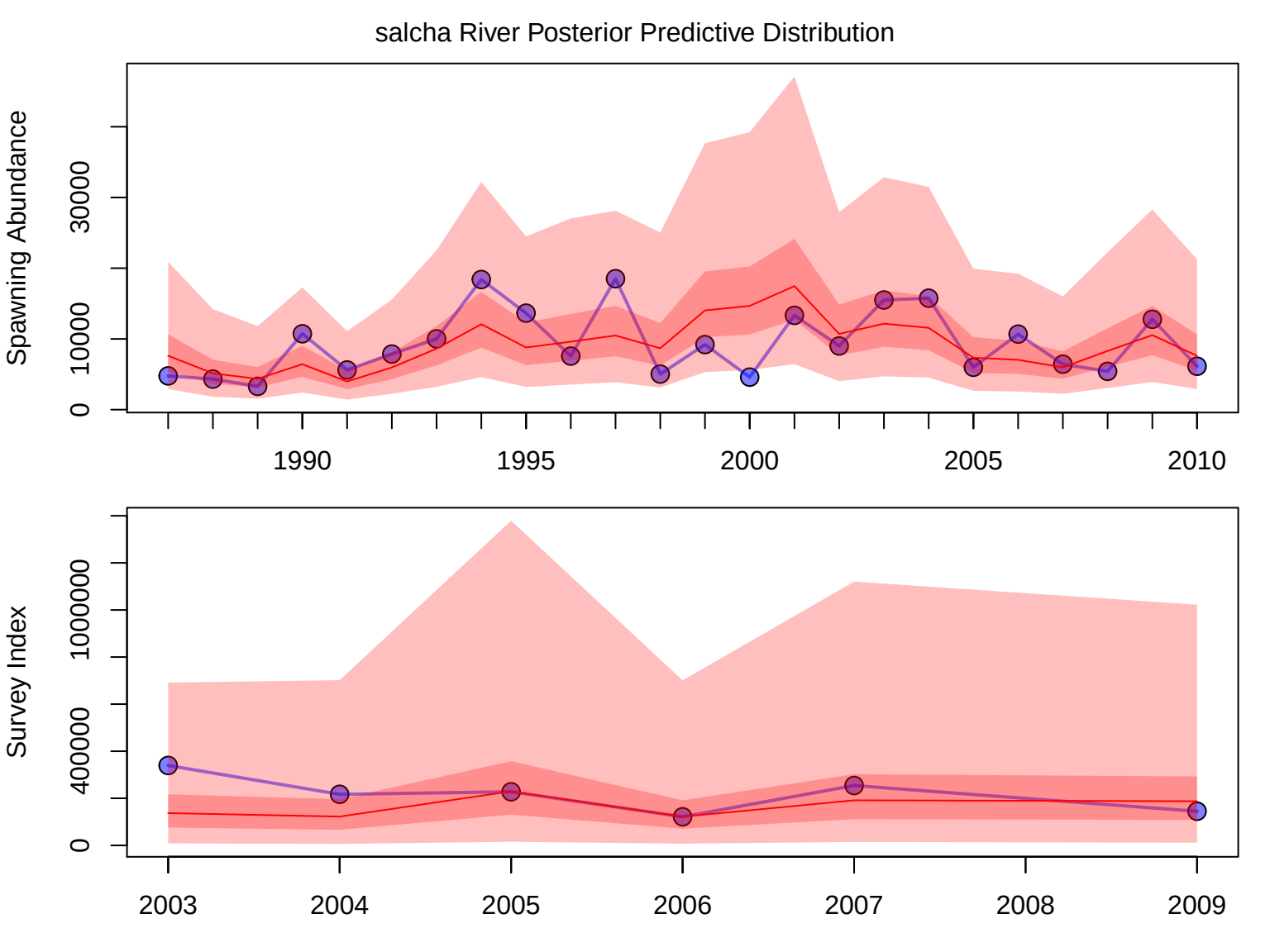
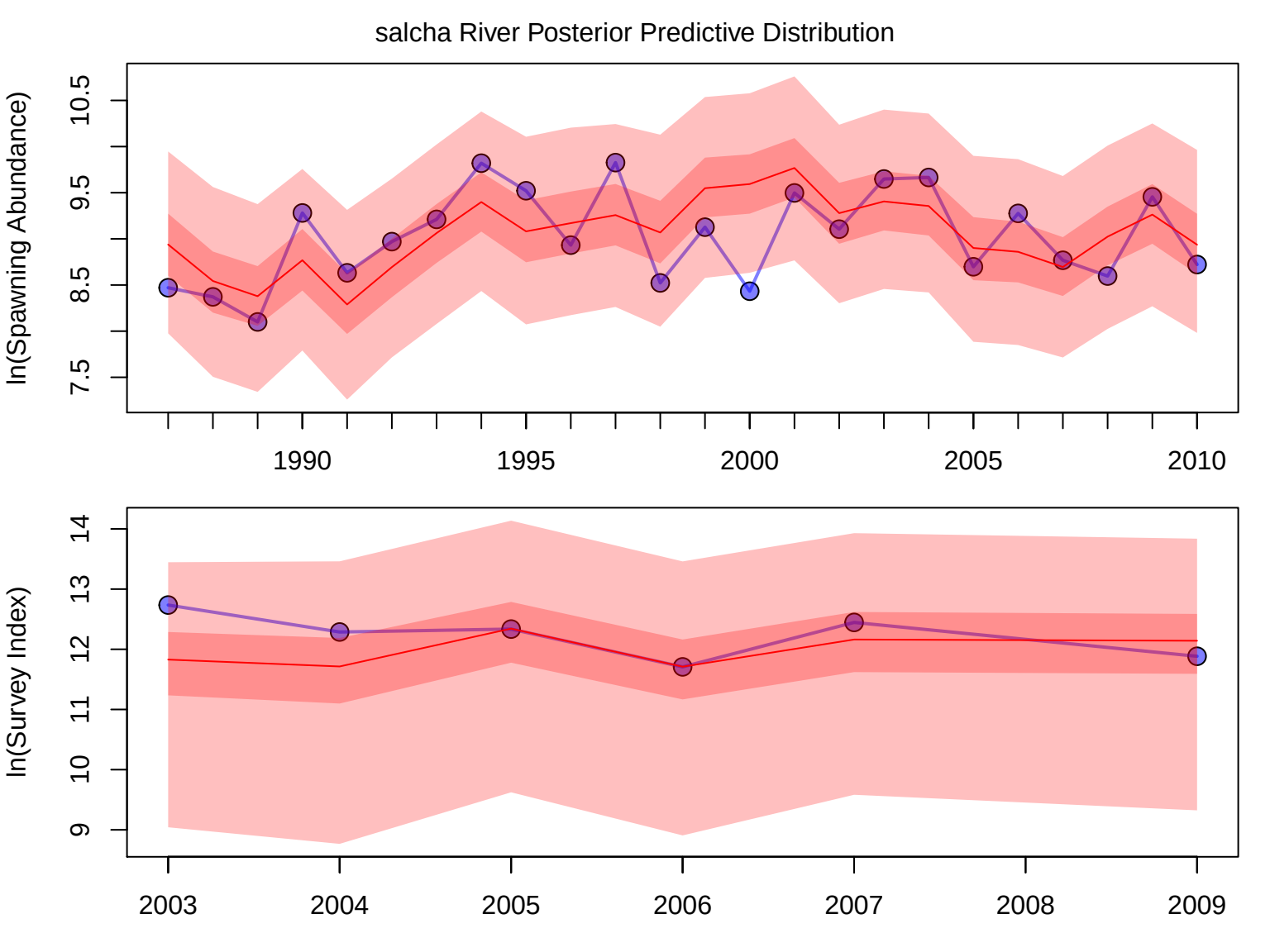
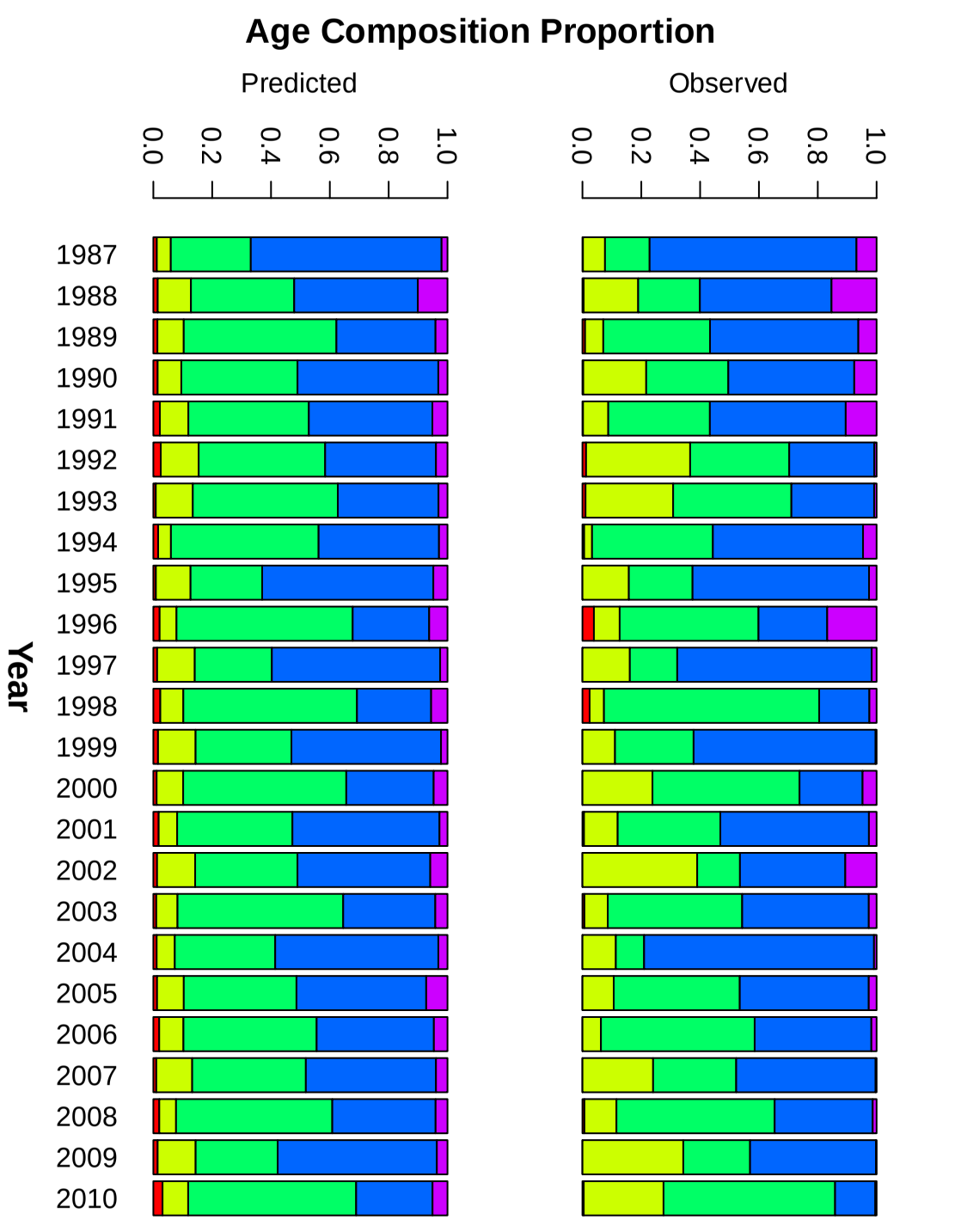
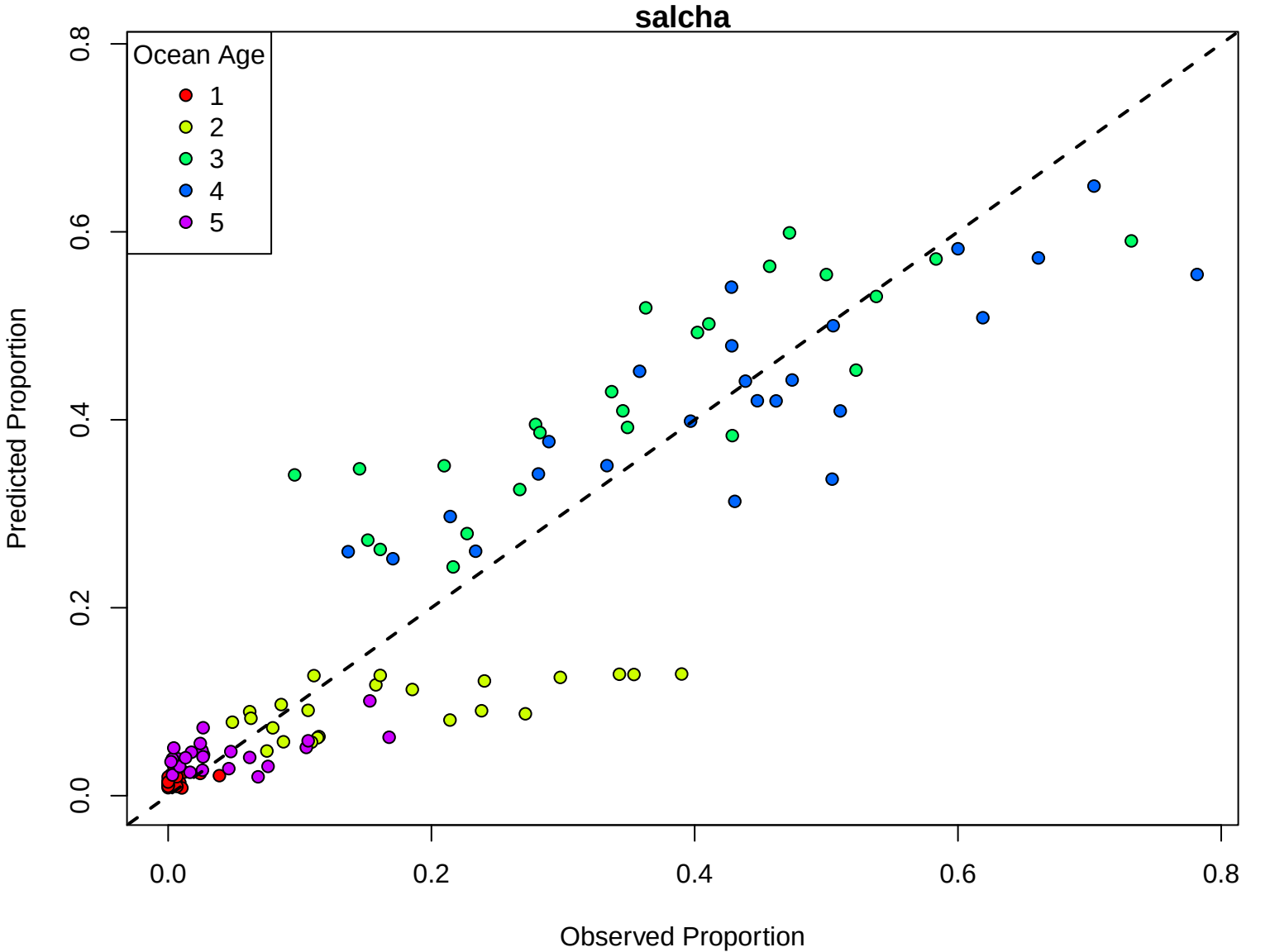

salcha River Posterior
Spawning Abundance
5000
15000
1990
1995
2000
2005
2010
Survey Index
1e+05
3e+05
2003
2004
2005
2006
2007
2008
2009

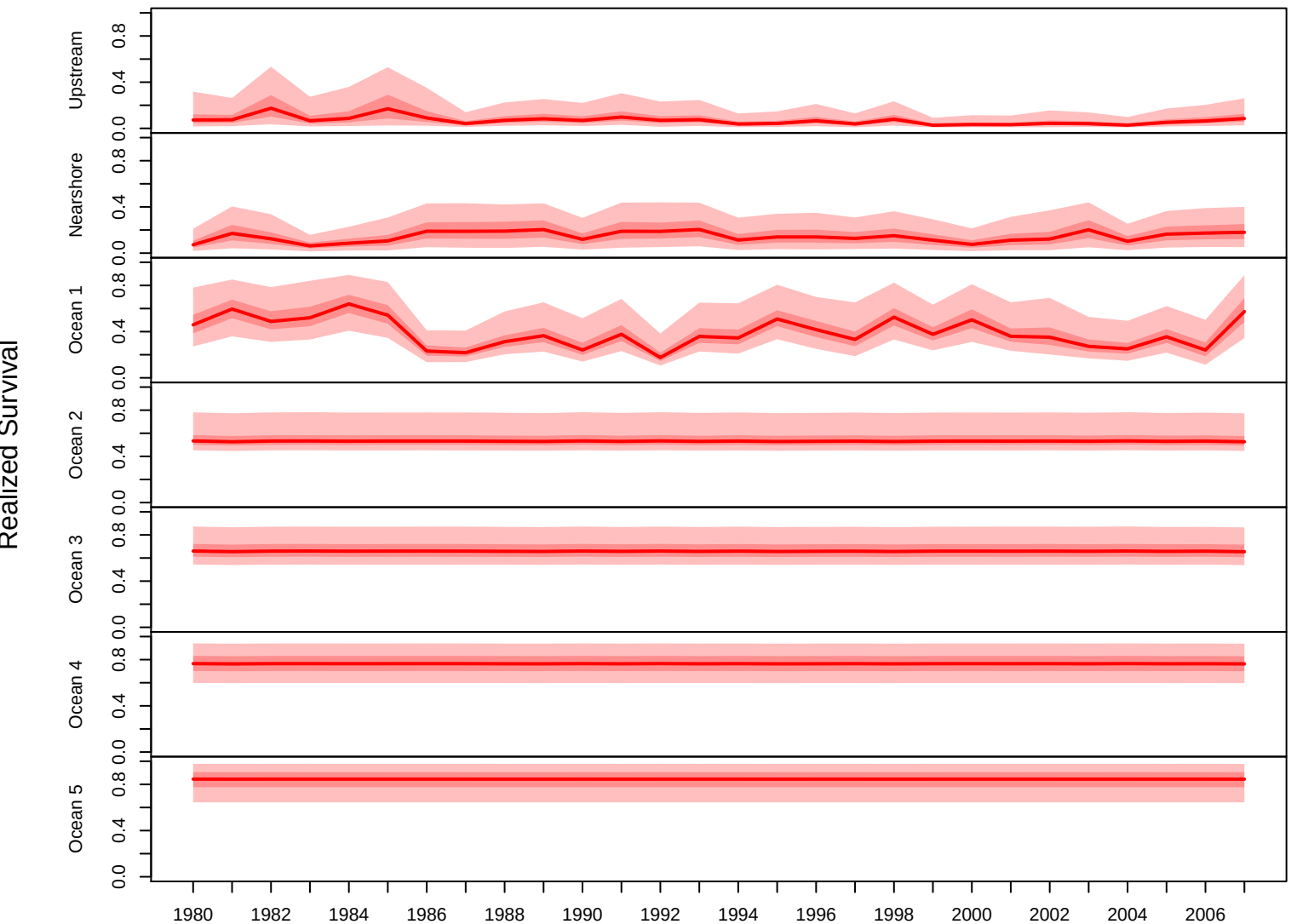

salcha River Posterior
ln(Spawning Abundance)
8.0
8.5
9.0
9.5
10.0
1990
1995
2000
2005
2010
ln(Survey Index)
10.5
11.5
12.5
2003
2004
2005
2006
2007
2008
2009

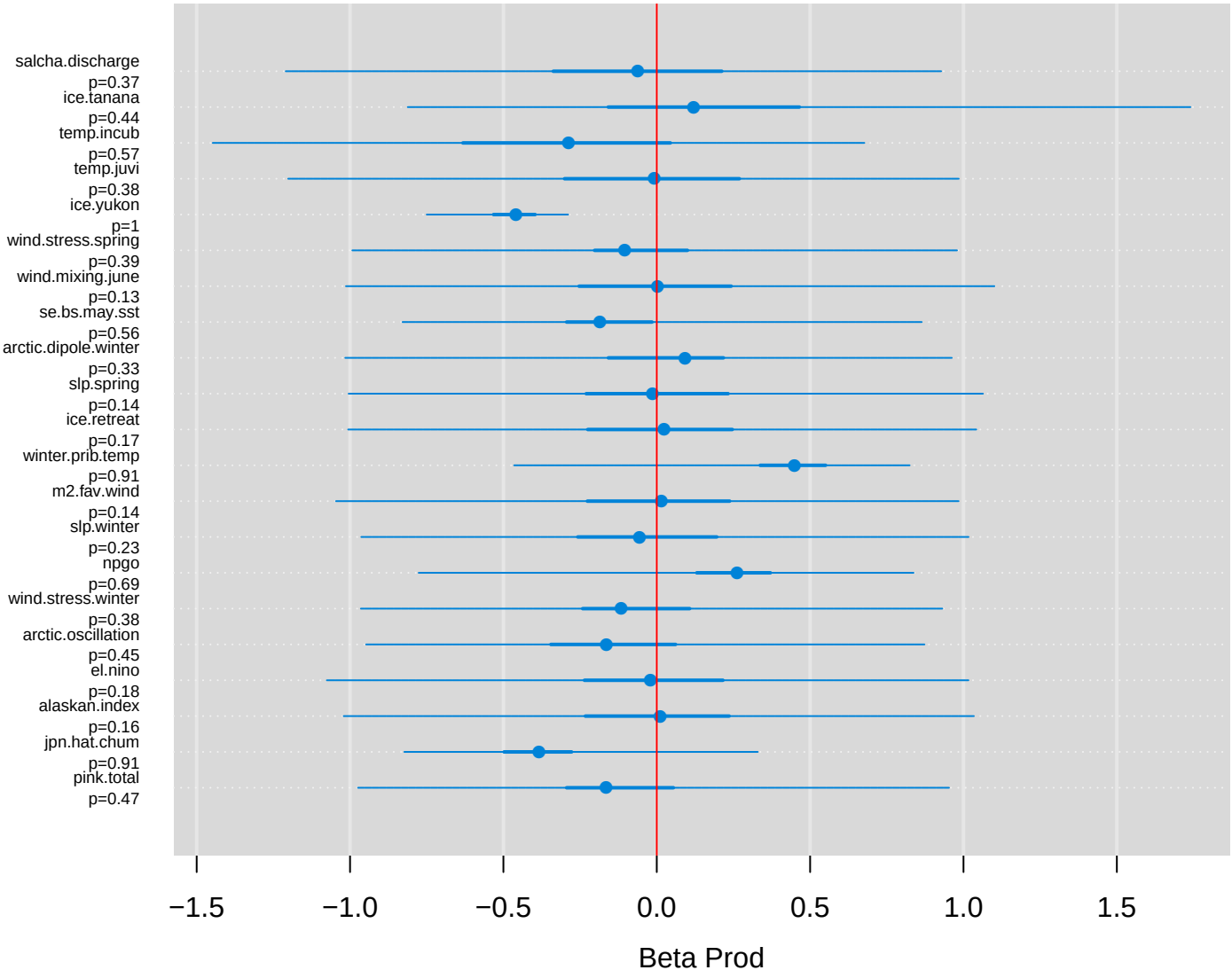

salcha River Posterior Predictive Distribution
Spawning Abundance
0
10000
30000
1990
1995
2000
2005
2010
Survey Index
0
400000
1000000
2003
2004
2005
2006
2007
2008
2009

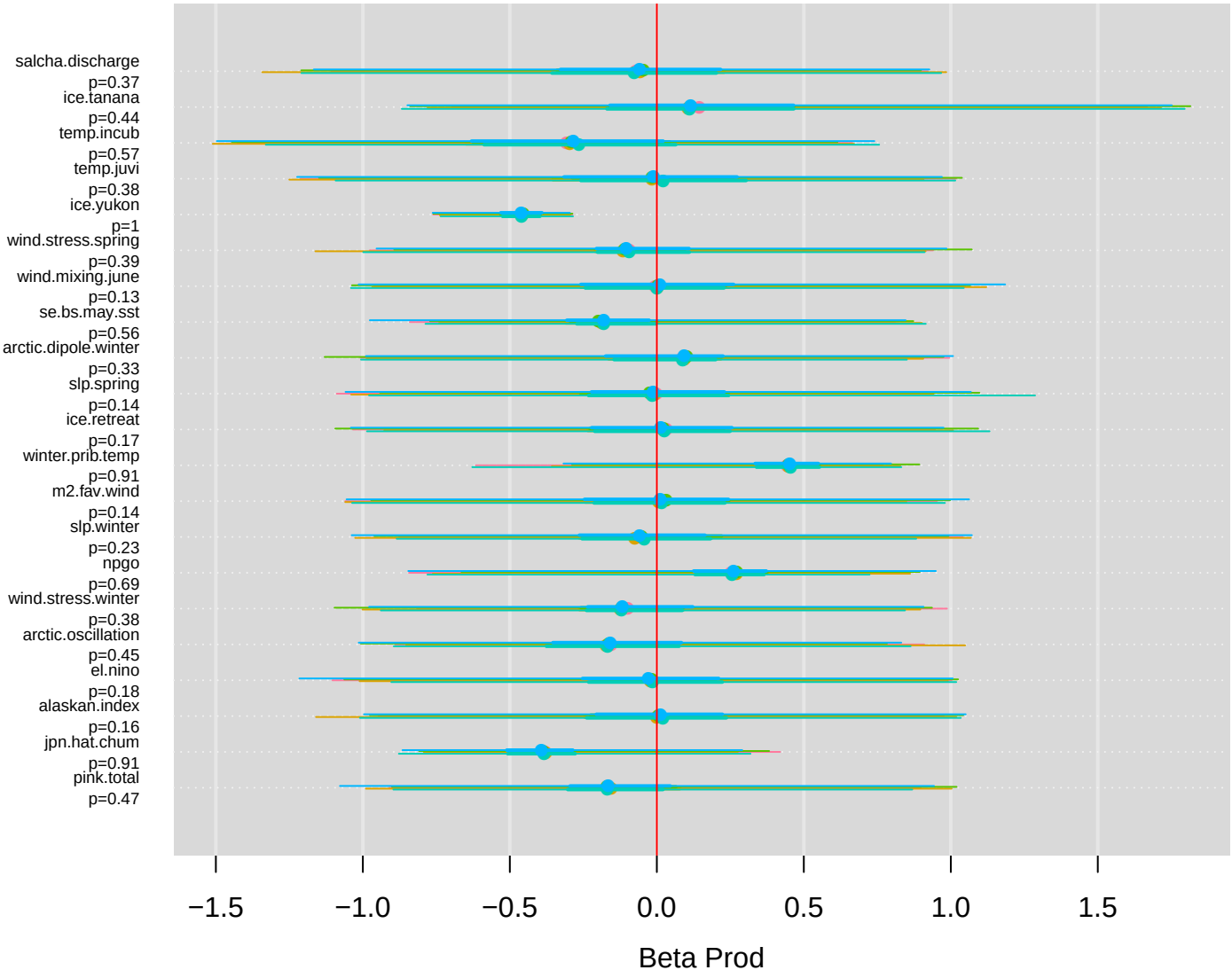

salcha River Posterior Predictive Distribution
ln(Spawning Abundance)
7.5
8.5
9.5
10.5
1990
1995
2000
2005
2010
ln(Survey Index)
9
10
11
12
13
14
2003
2004
2005
2006
2007
2008
2009

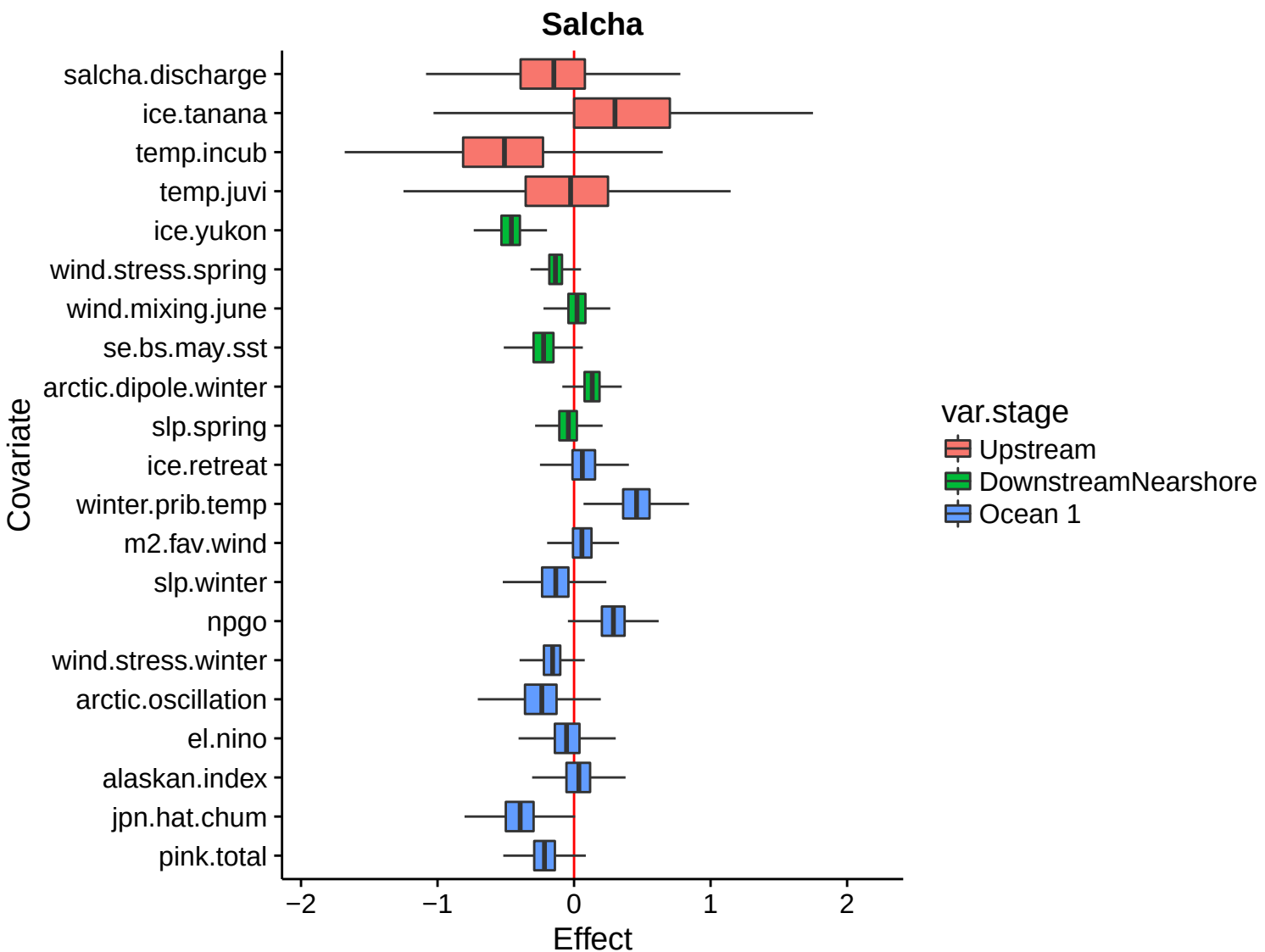

Age Composition Proportion
Predicted
Observed
0.0
0.2
0.4
0.6
0.8
1.0
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Year

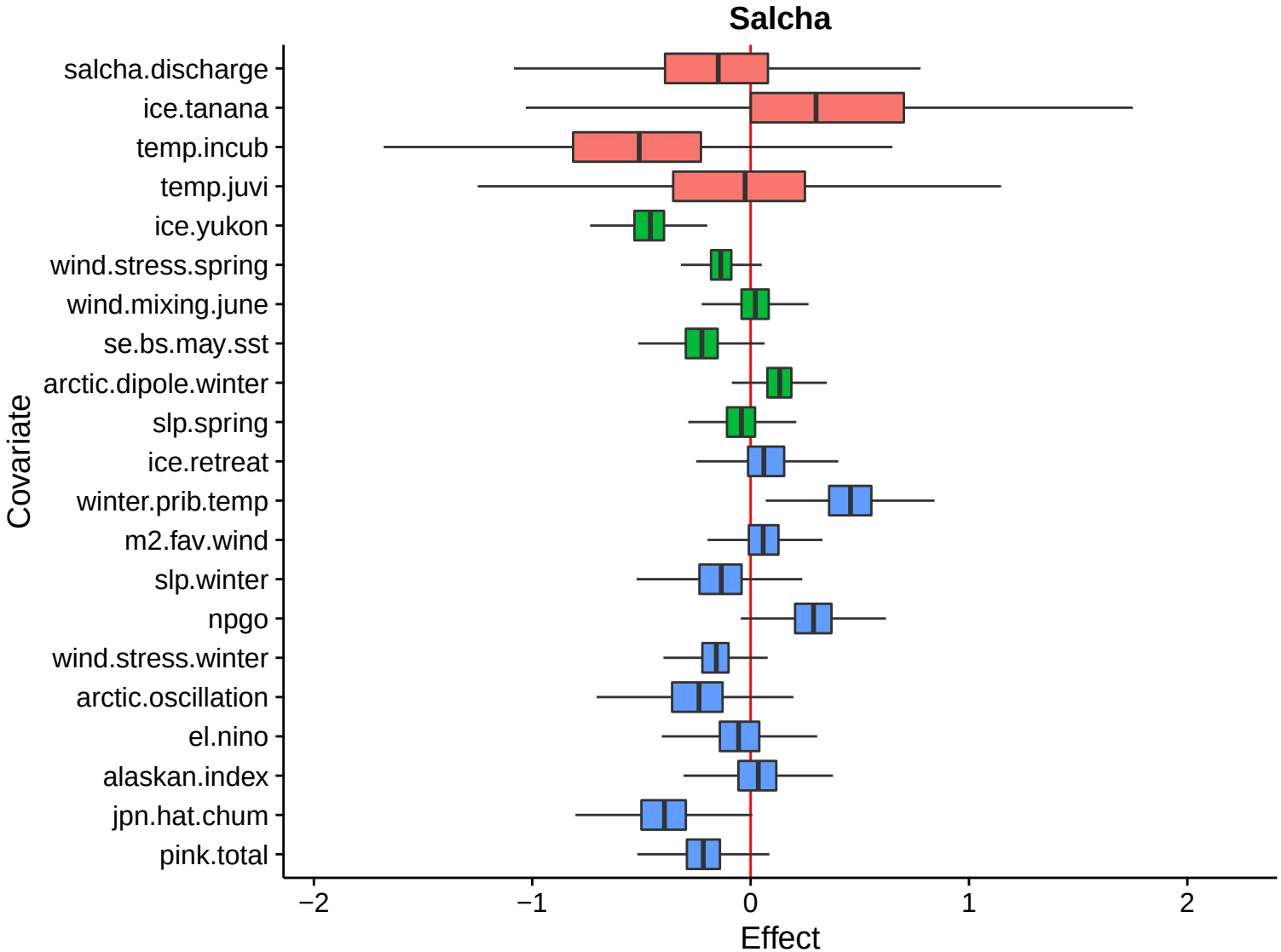

salcha
Ocean Age
1
2
3
4
5
Predicted Proportion
Observed Proportion
0.0
0.2
0.4
0.6
0.8

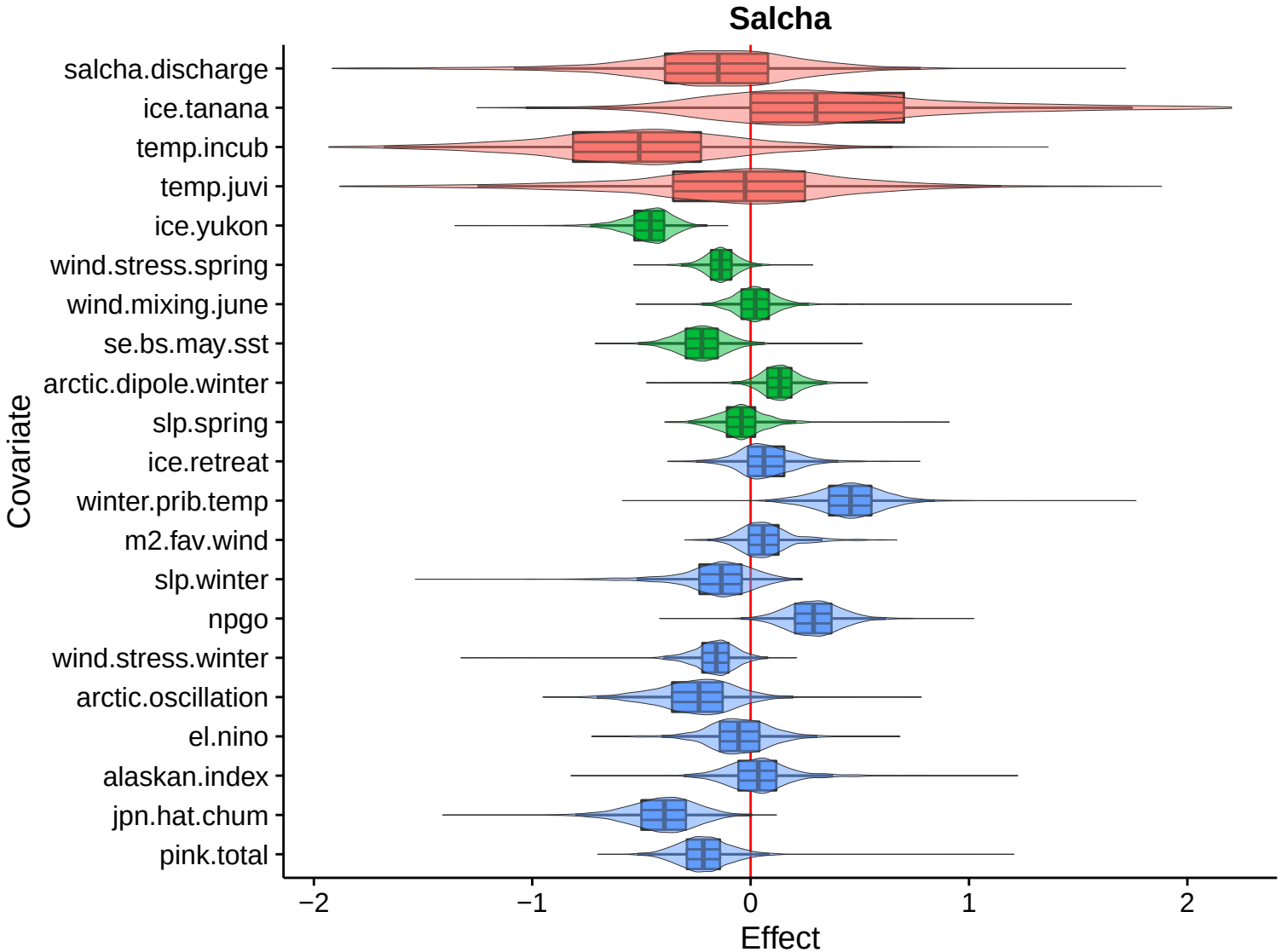

Realized Survival
Upstream
Nearshore
Ocean 1
Ocean 2
Ocean 3
Ocean 4
Ocean 5
0.0
0.4
0.8
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006

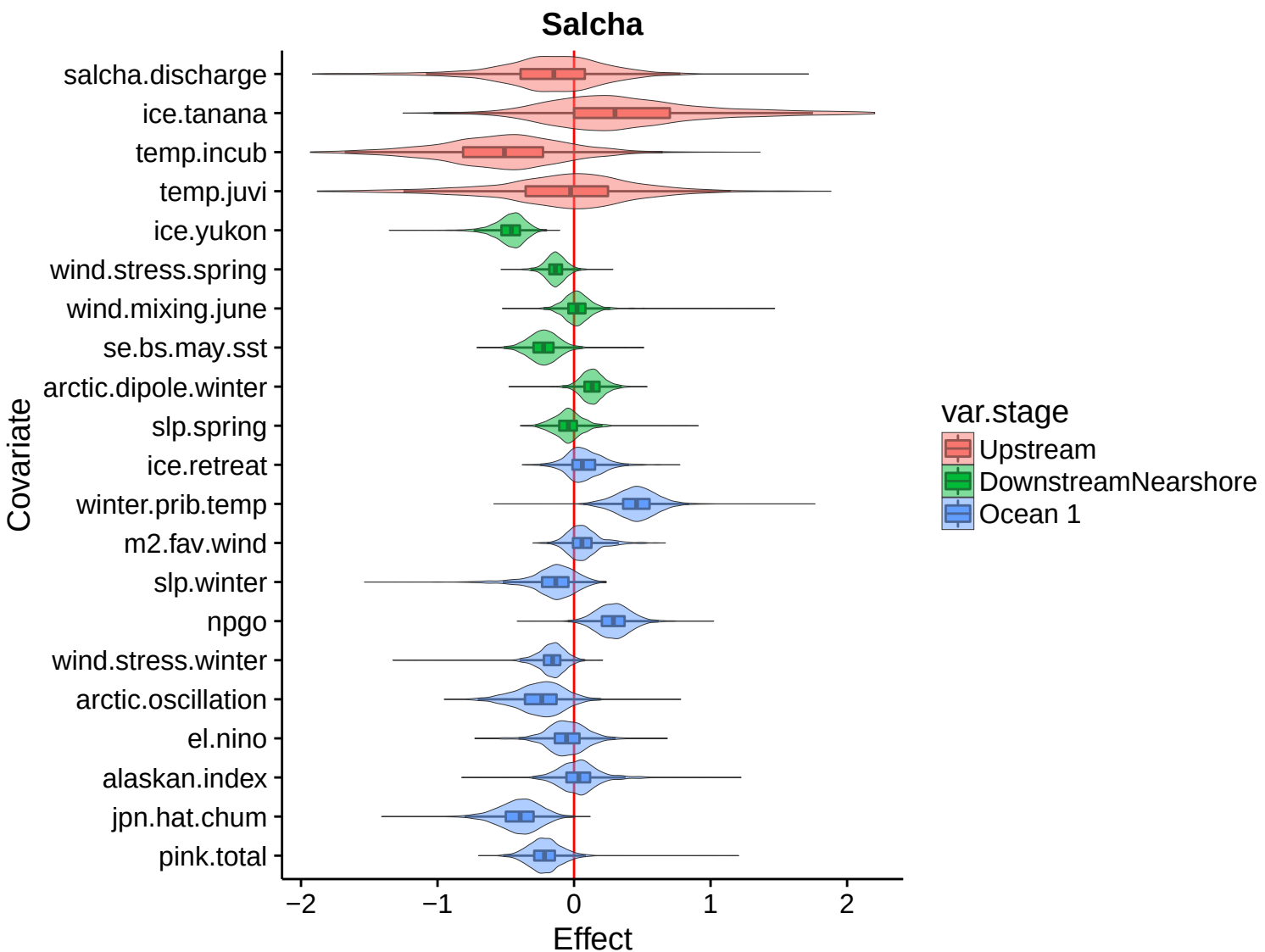

salcha.discharge
p=0.37
ice.tanana
p=0.44
temp.incub
p=0.57
temp.juvi
p=0.38
ice.yukon
p=1
wind.stress.spring
p=0.39
wind.mixing.june
p=0.13
se.bs.may.sst
p=0.56
arctic.dipole.winter
p=0.33
slp.spring
p=0.14
ice.retreat
p=0.17
winter.prib.temp
p=0.91
m2.fav.wind
p=0.14
slp.winter
p=0.23
npgo
p=0.69
wind.stress.winter
p=0.38
arctic.oscillation
p=0.45
el.nino
p=0.18
alaskan.index
p=0.16
jpn.hat.chum
p=0.91
pink.total
p=0.47
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5
Beta Prod

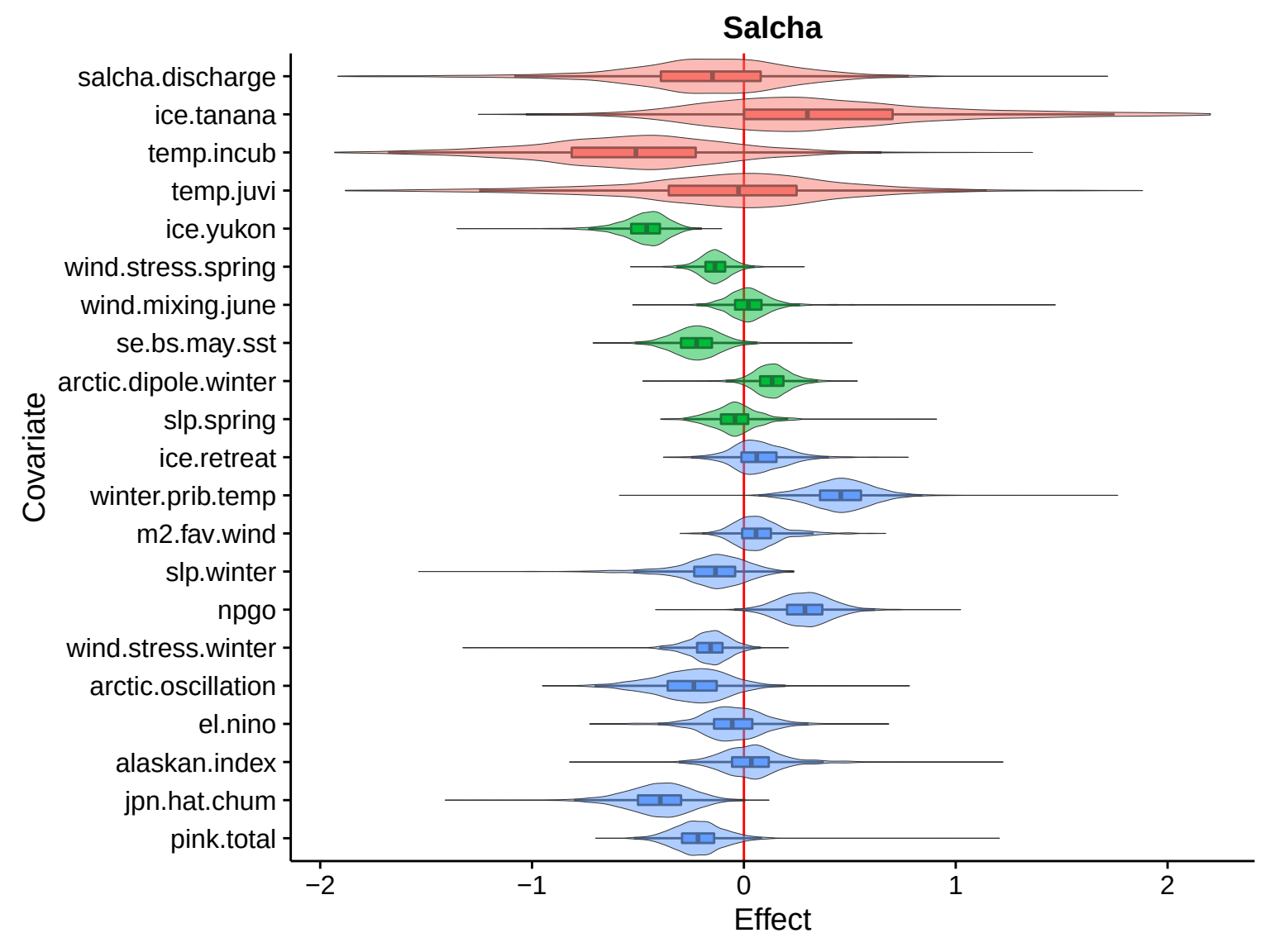

salcha.discharge
p=0.37
ice.tanana
p=0.44
temp.incub
p=0.57
temp.juvi
p=0.38
ice.yukon
p=1
wind.stress.spring
p=0.39
wind.mixing.june
p=0.13
se.bs.may.sst
p=0.56
arctic.dipole.winter
p=0.33
slp.spring
p=0.14
ice.retreat
p=0.17
winter.prib.temp
p=0.91
m2.fav.wind
p=0.14
slp.winter
p=0.23
npgo
p=0.69
wind.stress.winter
p=0.38
arctic.oscillation
p=0.45
el.nino
p=0.18
alaskan.index
p=0.16
jpn.hat.chum
p=0.91
pink.total
p=0.47
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5
Beta Prod

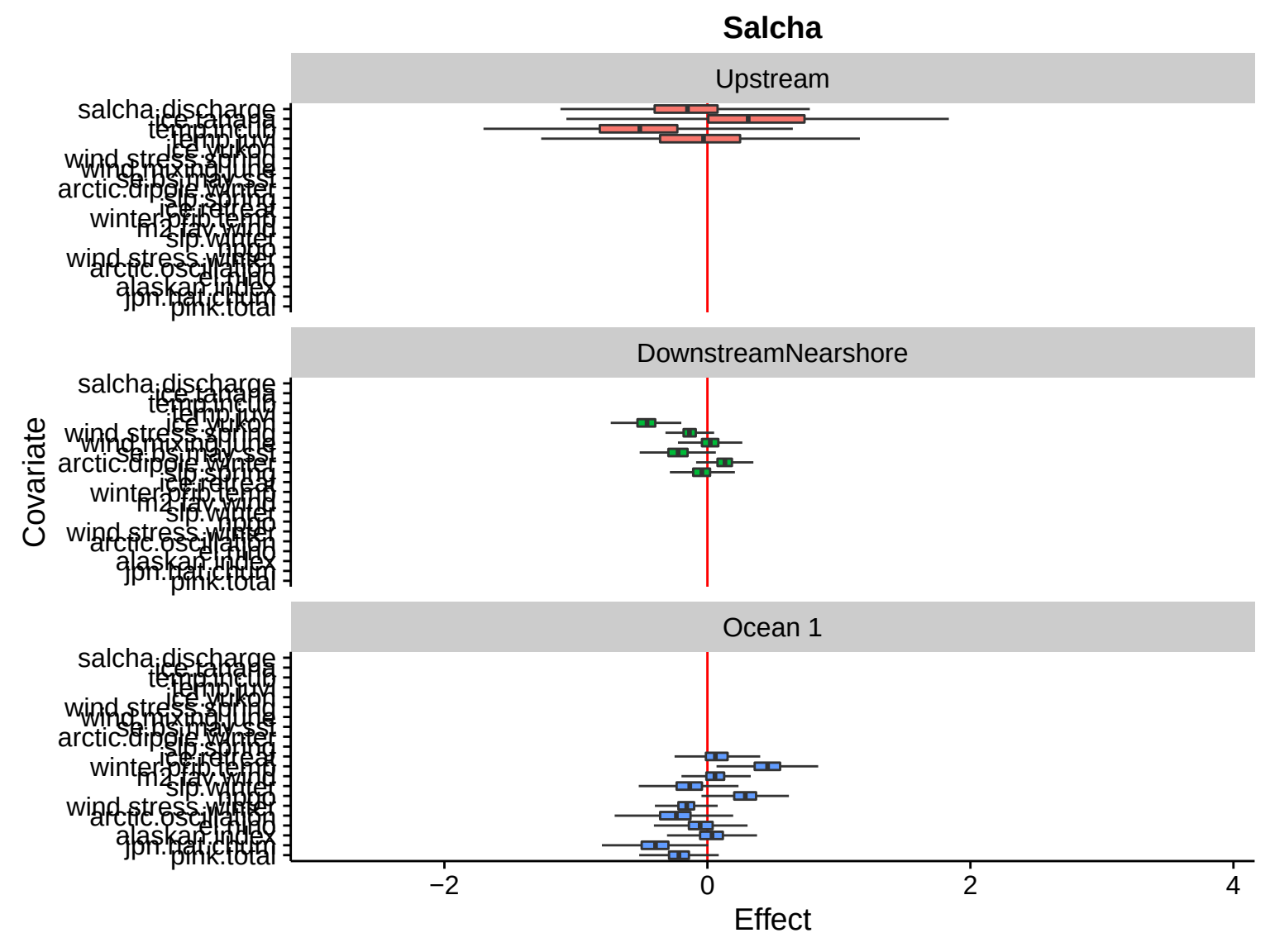

Salcha
salcha.discharge
ice.tanana
temp.incub
temp.juvi
ice.yukon
wind.stress.spring
wind.mixing.june
se.bs.may.sst
arctic.dipole.winter
slp.spring
ice.retreat
winter.prib.temp
m2.fav.wind
slp.winter
npgo
wind.stress.winter
arctic.oscillation
el.nino
alaskan.index
jpn.hat.chum
pink.total
Covariate
−2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


Salcha
salcha.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
2
Effect

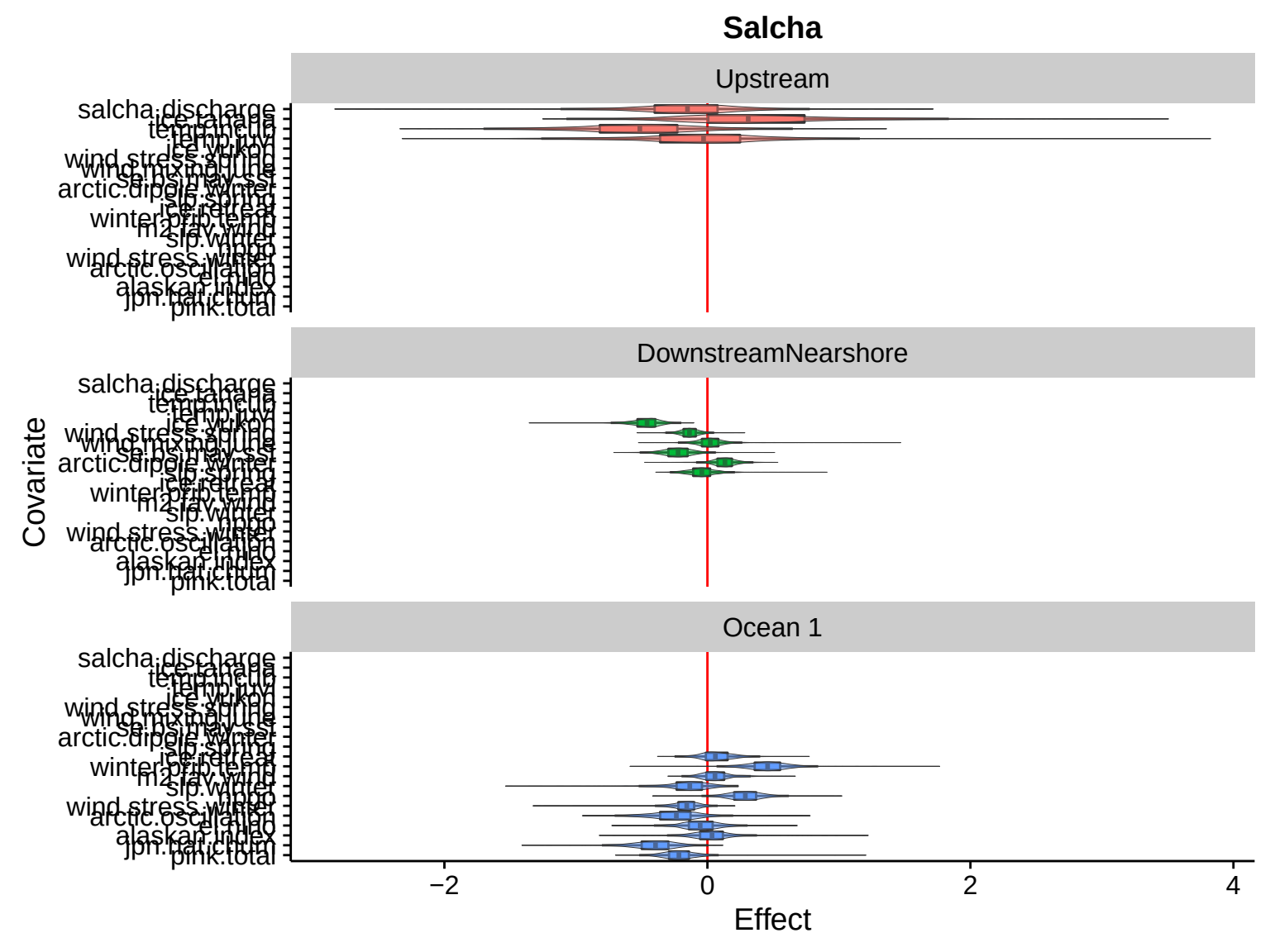

Salcha
salcha.discharge
ice.tanana
temp.incub
temp.juvi
ice.yukon
wind.stress.spring
wind.mixing.june
se.bs.may.sst
arctic.dipole.winter
slp.spring
ice.retreat
winter.prib.temp
m2.fav.wind
slp.winter
npgo
wind.stress.winter
arctic.oscillation
el.nino
alaskan.index
jpn.hat.chum
pink.total
Covariate
−2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


Salcha
salcha.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
2
Effect
var.stage
Upstream
DownstreamNearshore
Ocean 1

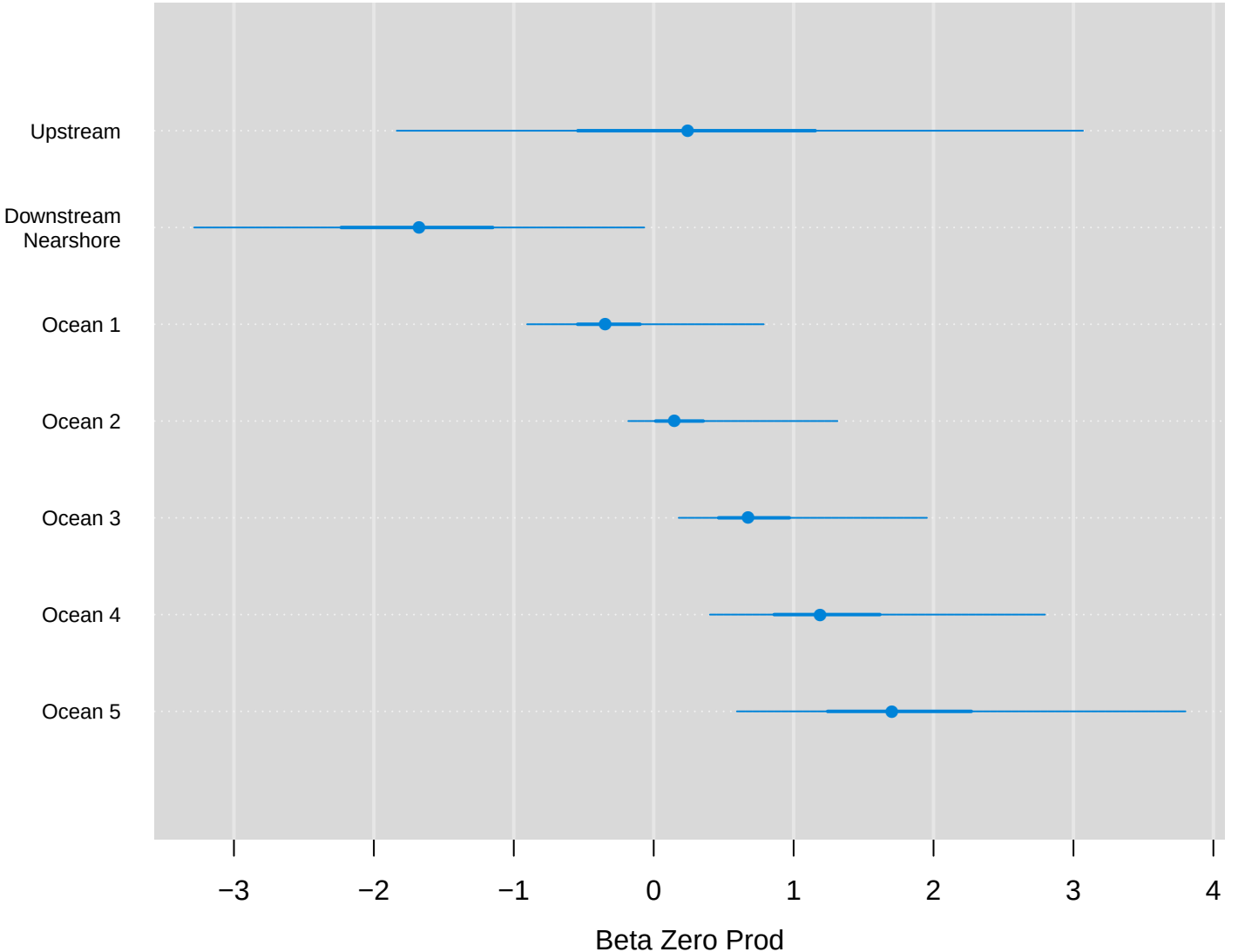

Salcha
salcha.discharge
ice.tanana
temp.incub
temp.juvi
ice.yukon
wind.stress.spring
wind.mixing.june
se.bs.may.sst
arctic.dipole.winter
slp.spring
ice.retreat
winter.prib.temp
m2.fav.wind
slp.winter
npgo
wind.stress.winter
arctic.oscillation
el.nino
alaskan.index
jpn.hat.chum
pink.total
Covariate
−2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

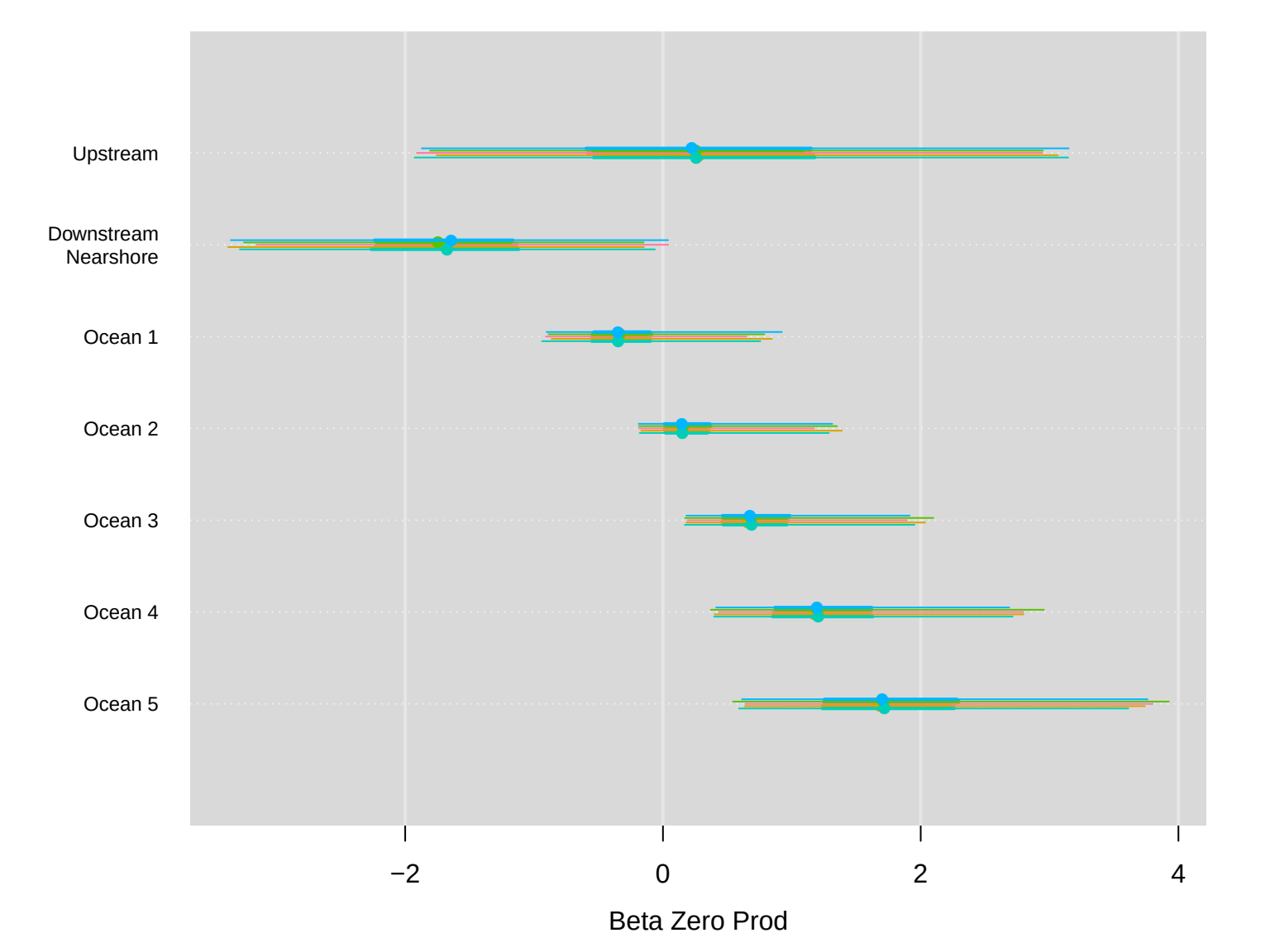


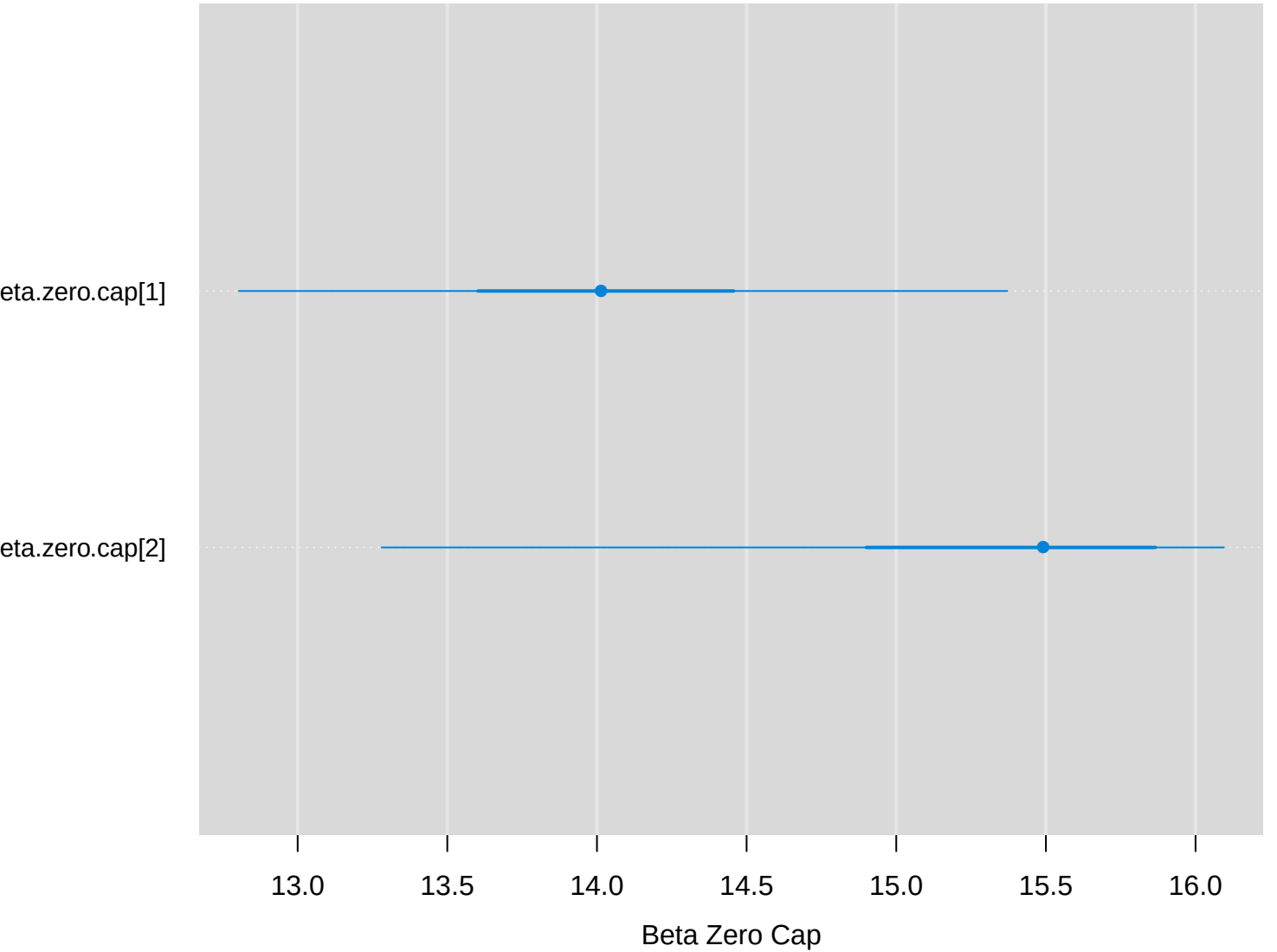
Salcha
Upstream
DownstreamNearshore
Ocean 1
salcha.discharge
ice.tanana
temp.inclin
temp.juv
ice.yukon
wind.stress.spring
wind.mixing.juve
se.psi.may.sst
arctic.dipole.winter
ice.retreat
winter.prib.temp
m2.fav.wind
slp.winter
wind.stress.winter
arctic.oscillation
alaskan.index
jpn.hatichum
pink.total
Covariate
−2
0
2
4
Effect



Salcha
Upstream
DownstreamNearshore
Ocean 1
salcha.discharge
ice.tanana
temp.inclu
temp.juv
ice.yukon
wind.stress.spring
wind.mixing.June
se.psi.may.sst
arctic.dipole.winter
ice.retreat
winter.prib.temp
m2.fav.wind
slp.winter
wind.stress.winter
arctic.oscillation
alaskan.index
jpn.hat.chum
pink.total
Covariate
−2
0
2
4
Effect


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


Upstream
Downstream
Nearshore
Ocean 1
Ocean 2
Ocean 3
Ocean 4
Ocean 5
−2
0
2
4
Beta Zero Prod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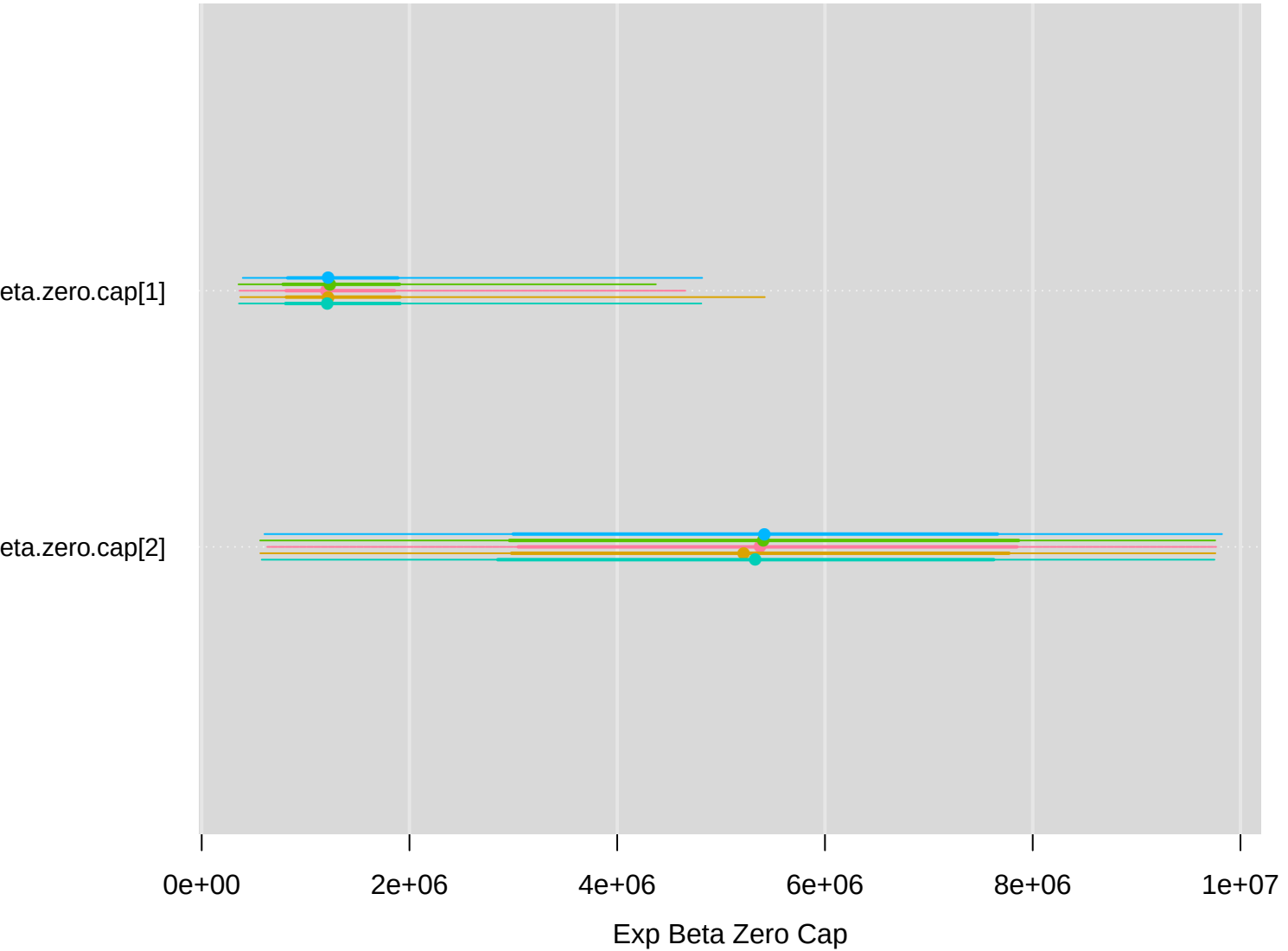
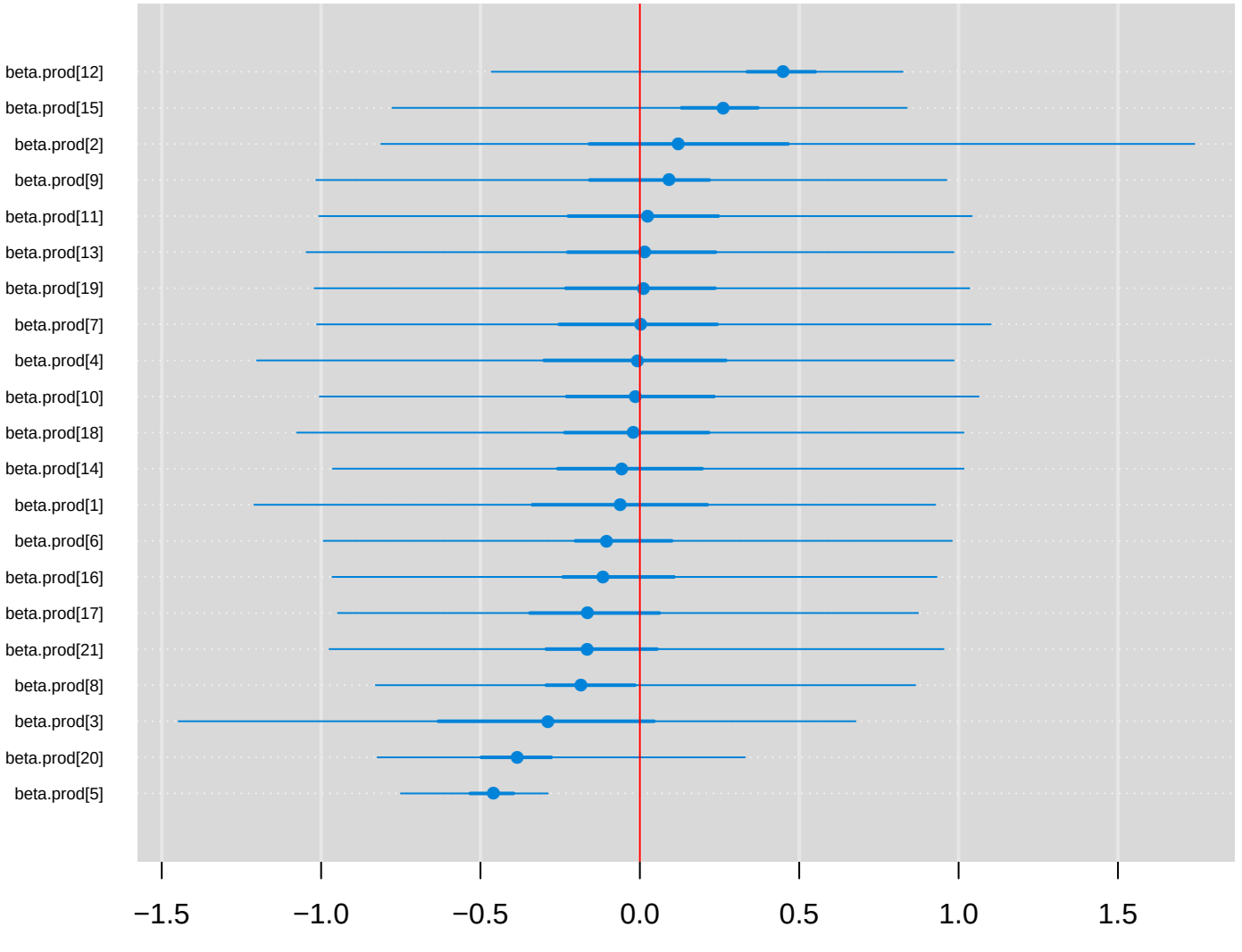
eta.zero.cap[2]
13.0
13.5
14.0
14.5
15.0
15.5
16.0
Beta Zero Cap


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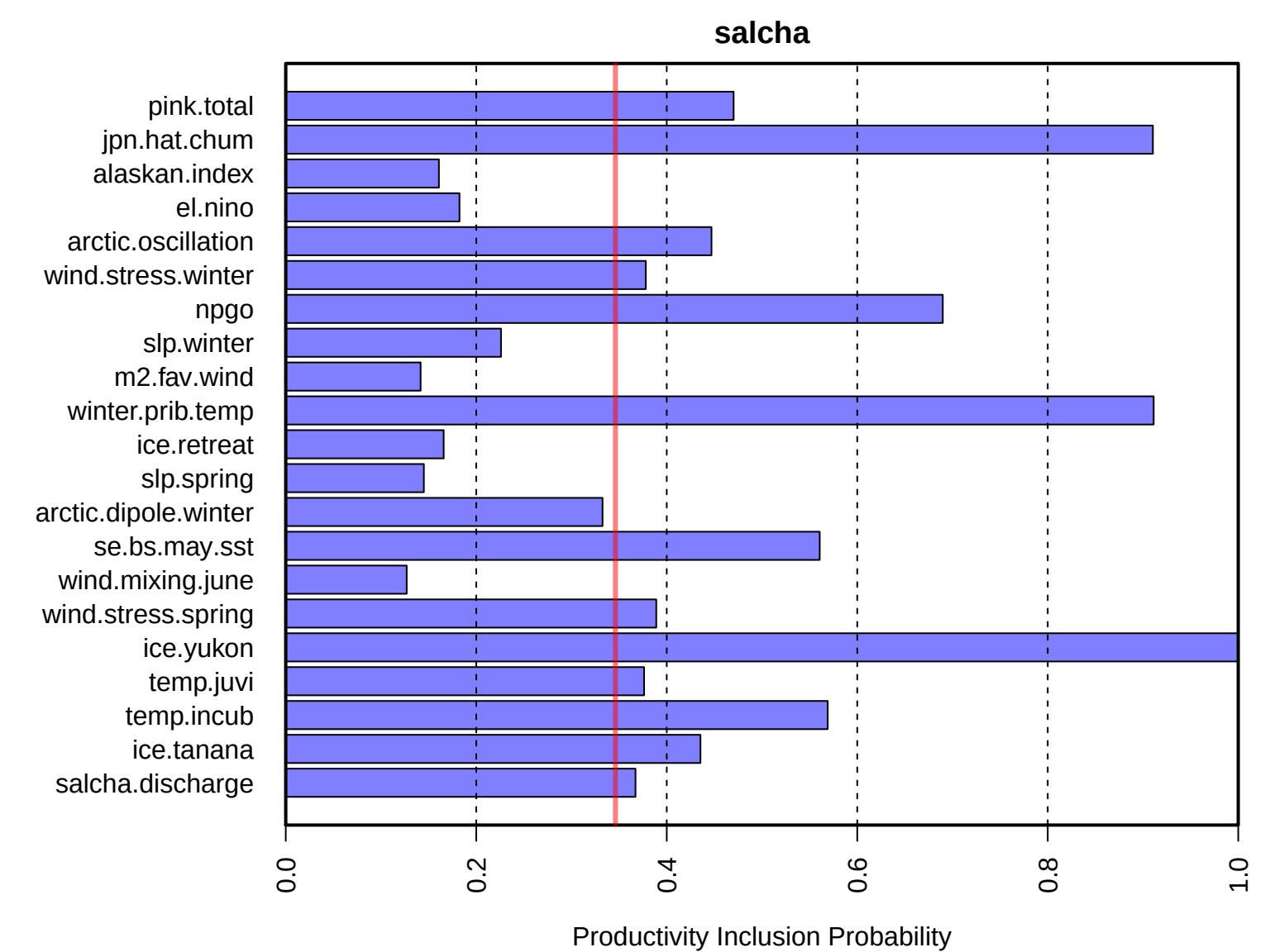
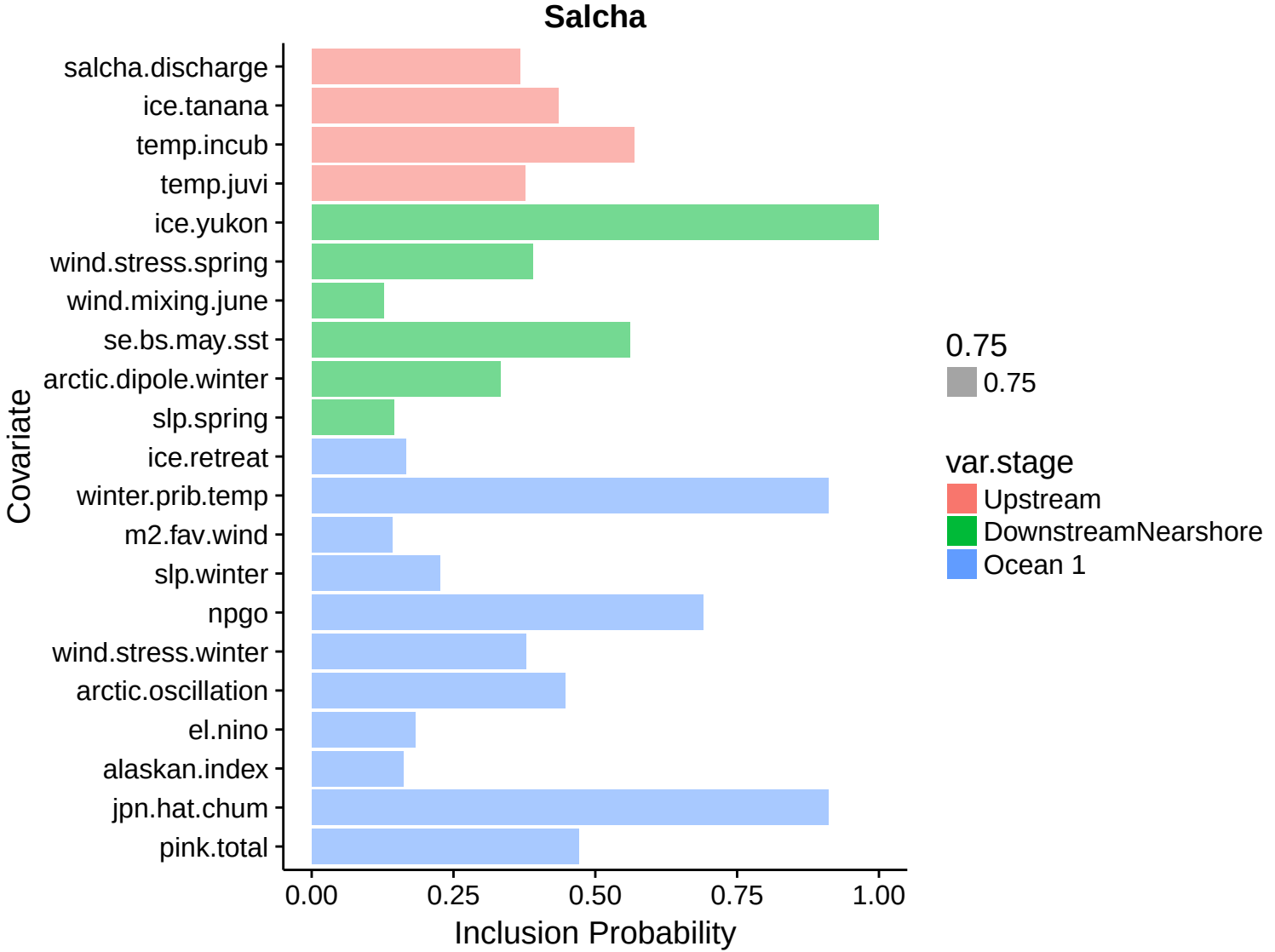
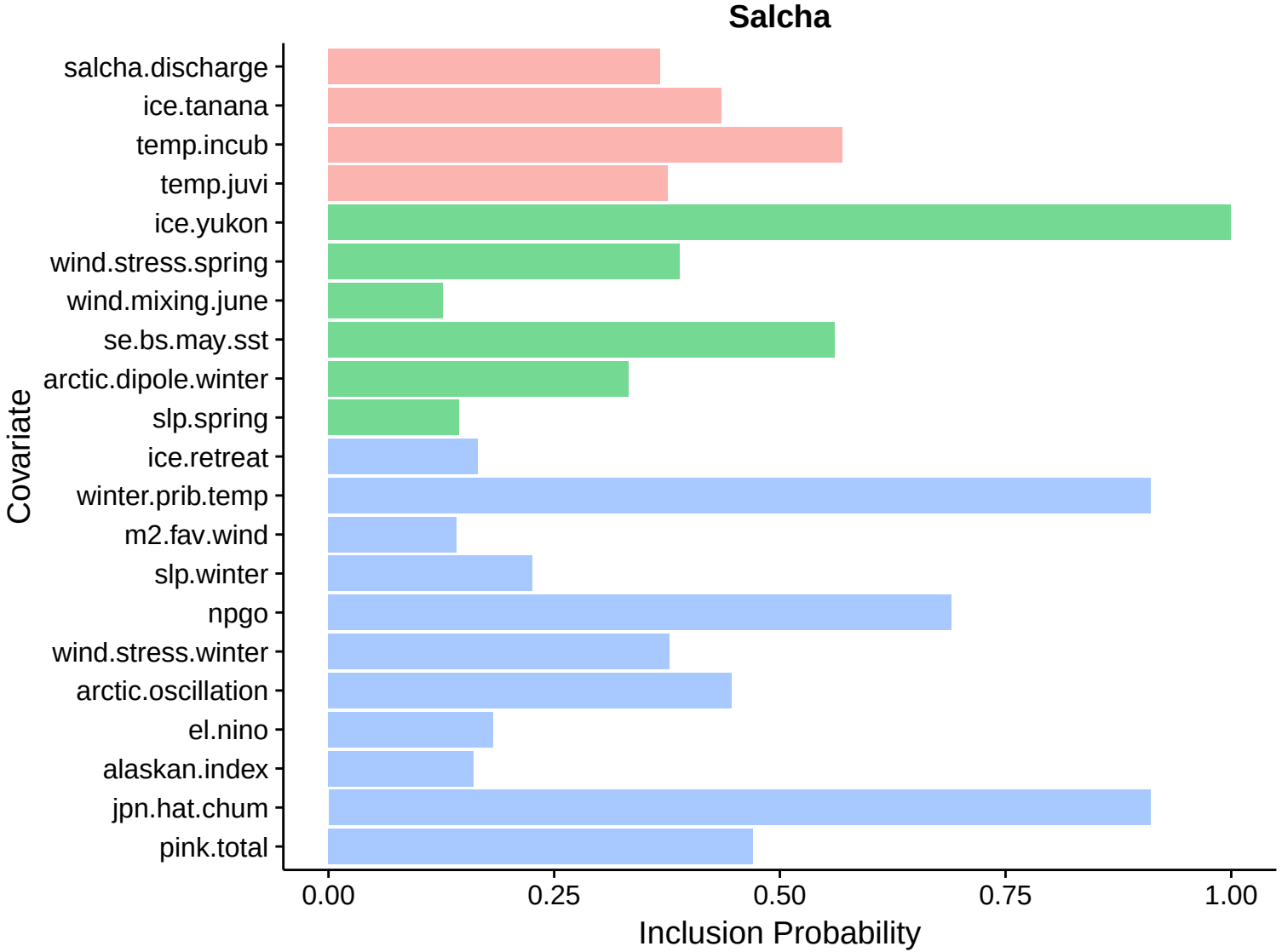
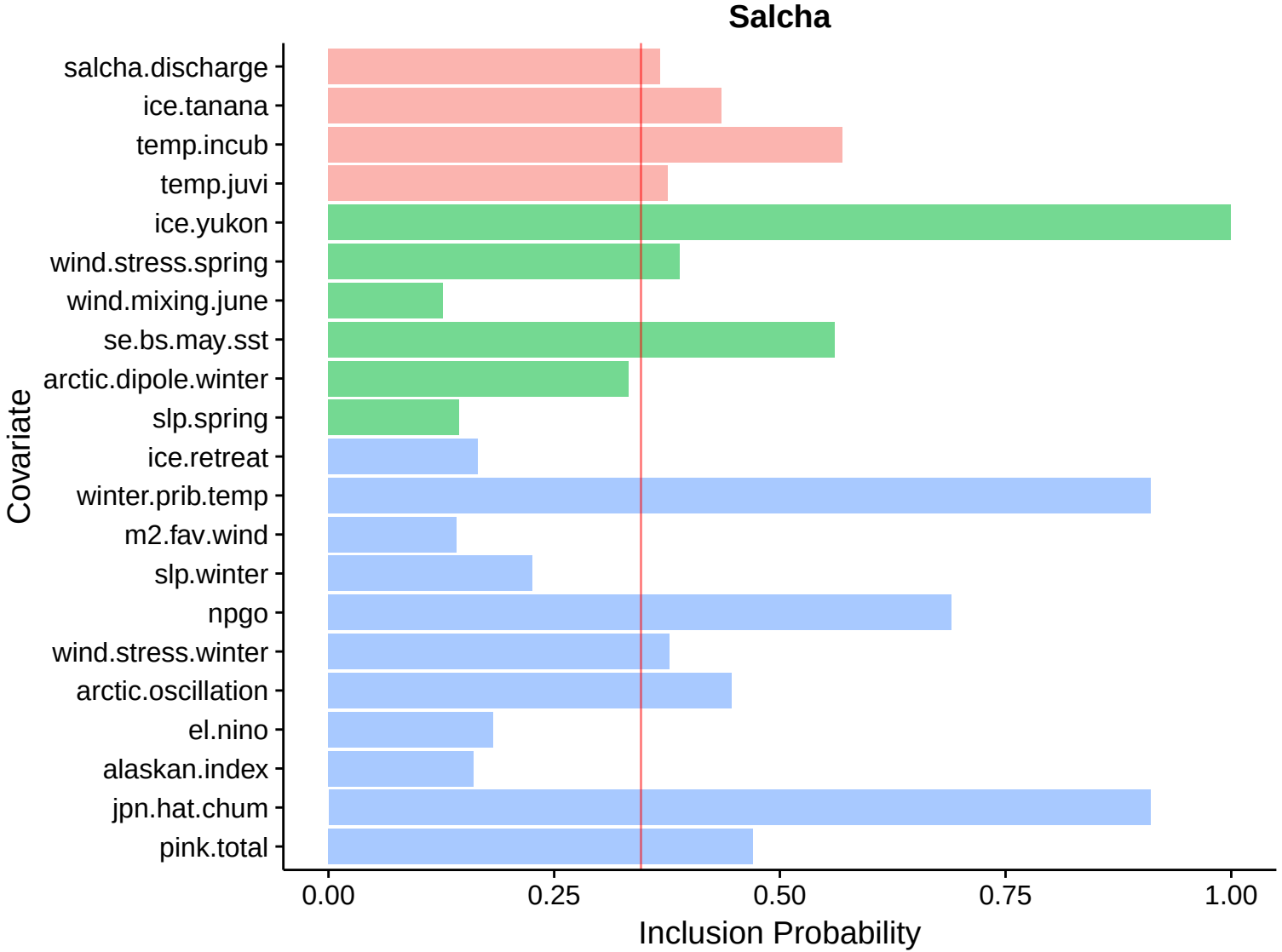
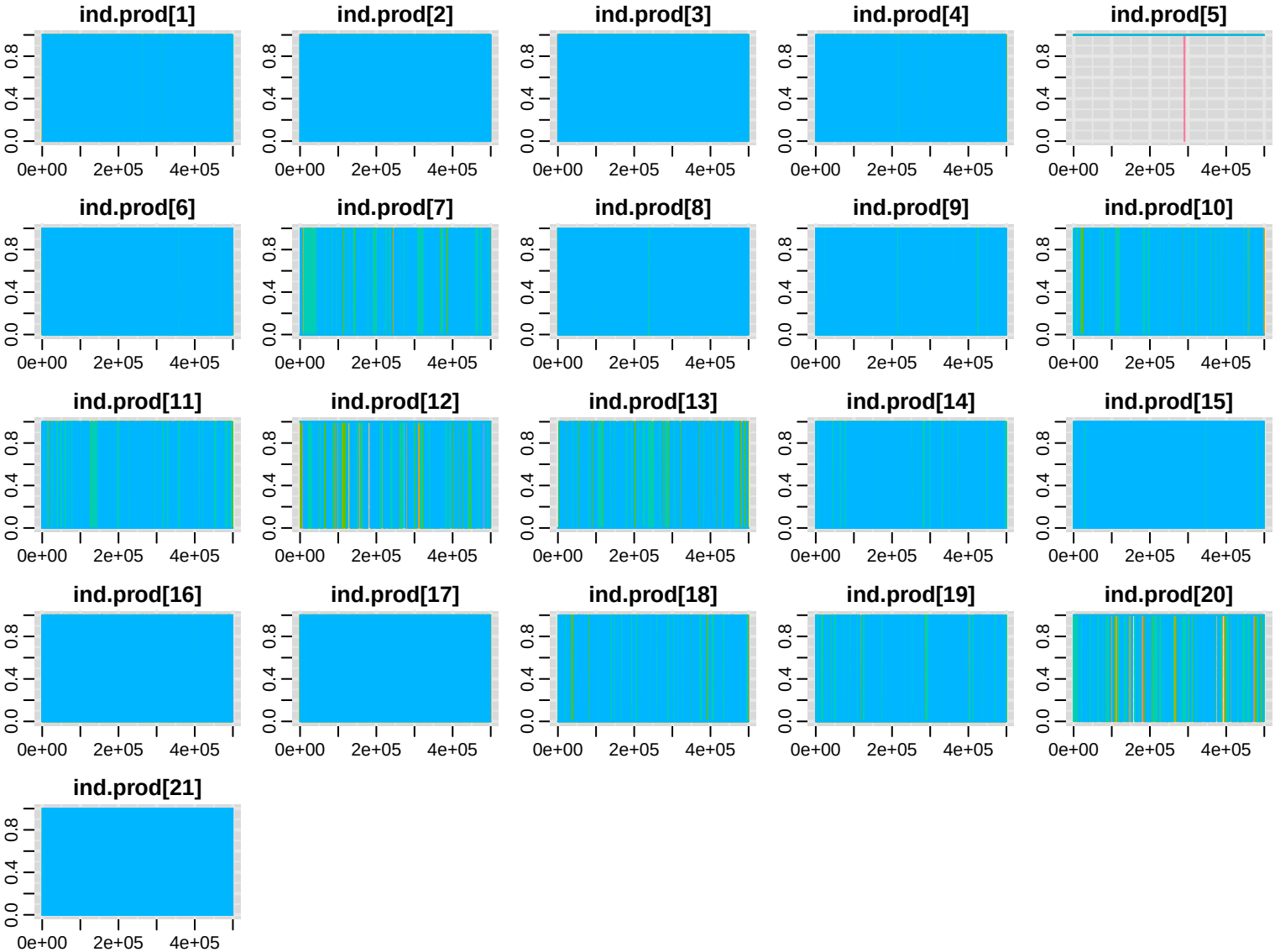
−1.0
−0.5
0.0
0.5
1.0
1.5

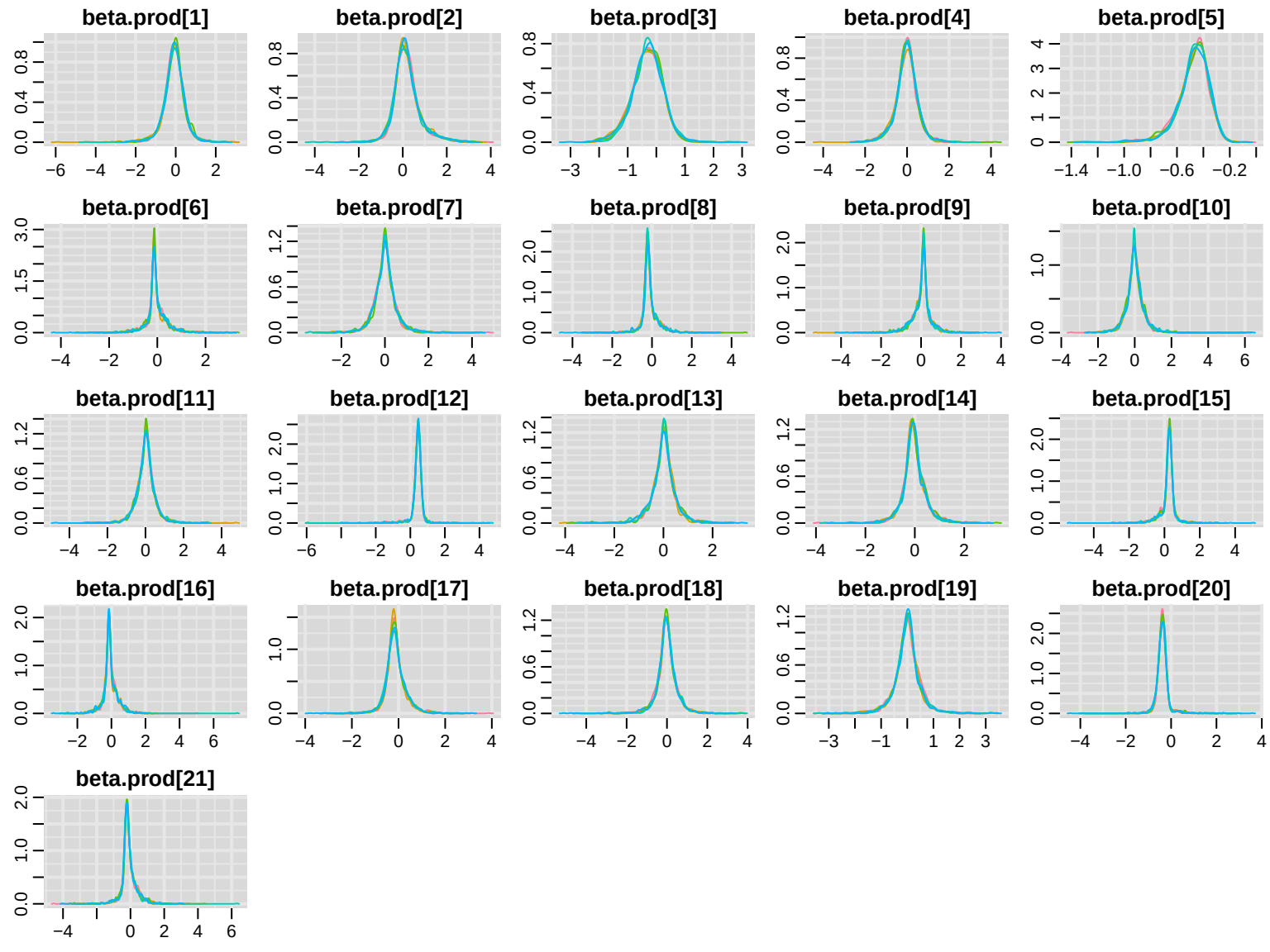

salcha
pink.total
jpn.hat.chum
alaskan.index
el.nino
arctic.oscillation
wind.stress.winter
npgo
slp.winter
m2.fav.wind
winter.prib.temp
ice.retreat
slp.spring
arctic.dipole.winter
se.bs.may.sst
wind.mixing.june
wind.stress.spring
ice.yukon
temp.juvi
temp.incub
ice.tanana
salcha.discharge
0.0
0.2
0.4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

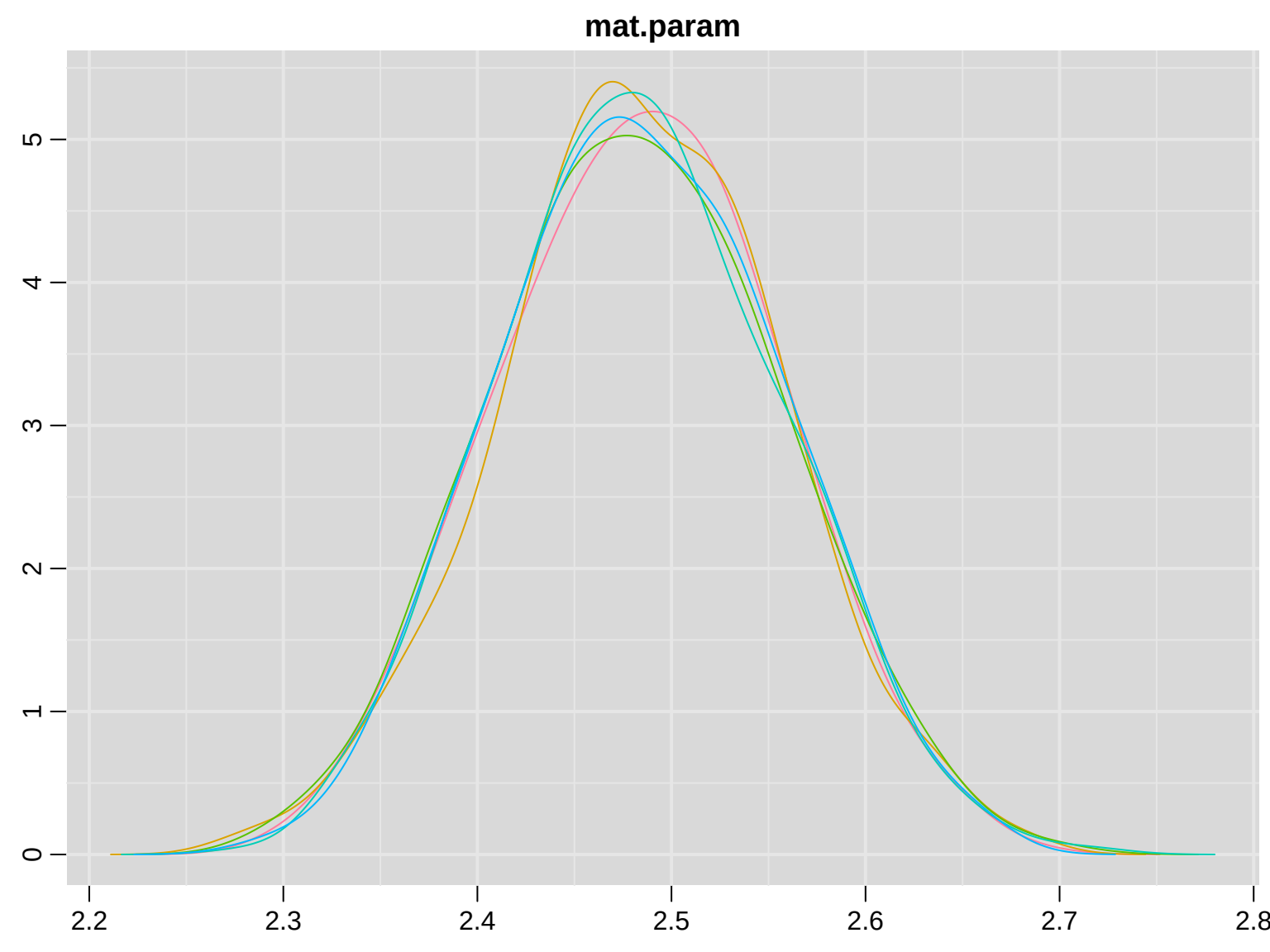

Salcha
salcha.discharge
ice.tanana
temp.incub
temp.juvi
ice.yukon
wind.stress.spring
wind.mixing.june
se.bs.may.sst
arctic.dipole.winter
slp.spring
ice.retreat
winter.prib.temp
m2.fav.wind
slp.winter
npgo
wind.stress.winter
arctic.oscillation
el.nino
alaskan.index
jpn.hat.chum
pink.total
Covariate
0.00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

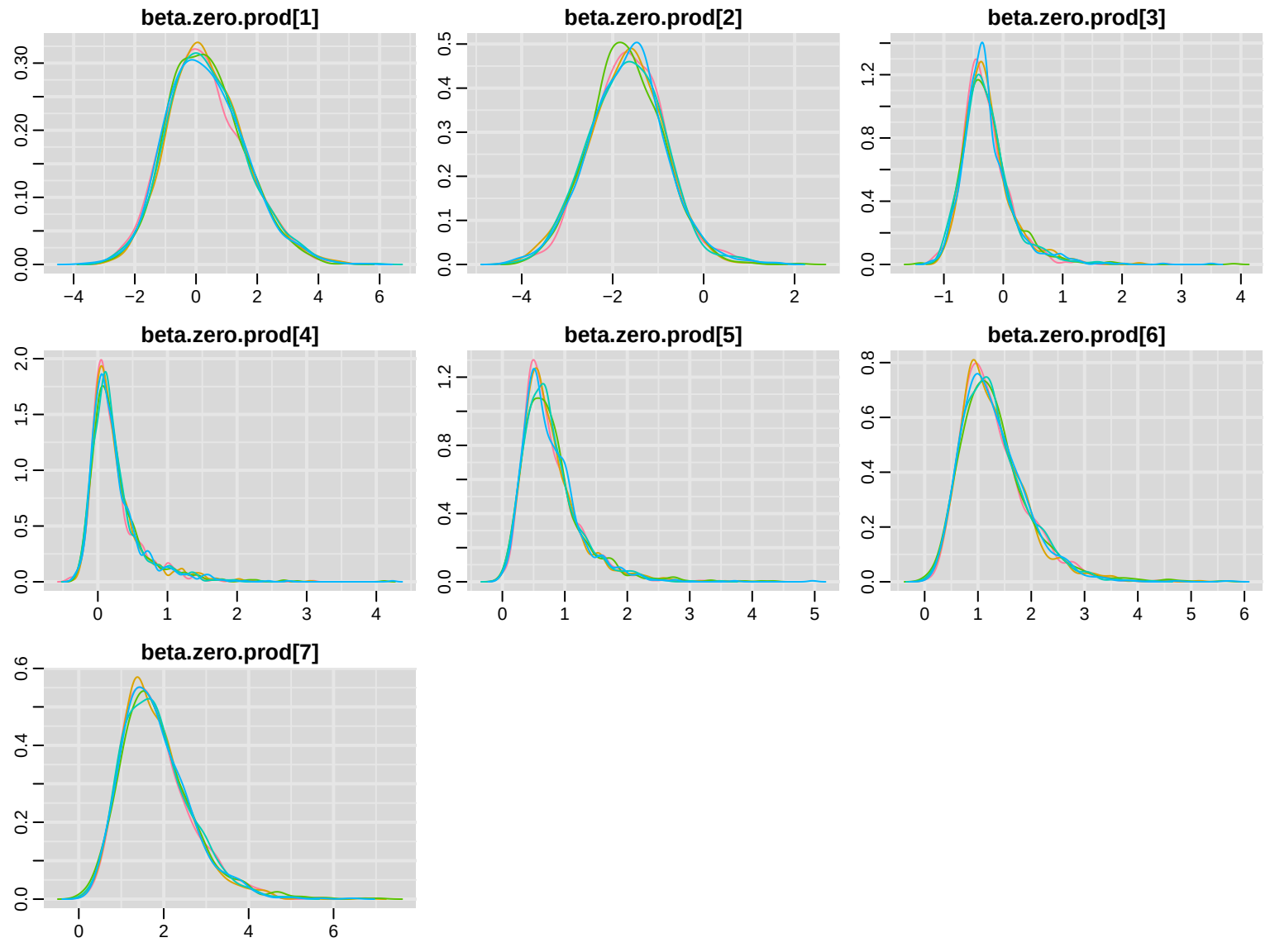

Salcha
salcha.discharge
ice.tanana
temp.incub
temp.juvi
ice.yukon
wind.stress.spring
wind.mixing.june
se.bs.may.sst
arctic.dipole.winter
slp.spring
ice.retreat
winter.prib.temp
m2.fav.wind
slp.winter
npgo
wind.stress.winter
arctic.oscillation
el.nino
alaskan.index
jpn.hat.chum
pink.total
Covariate
0.00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

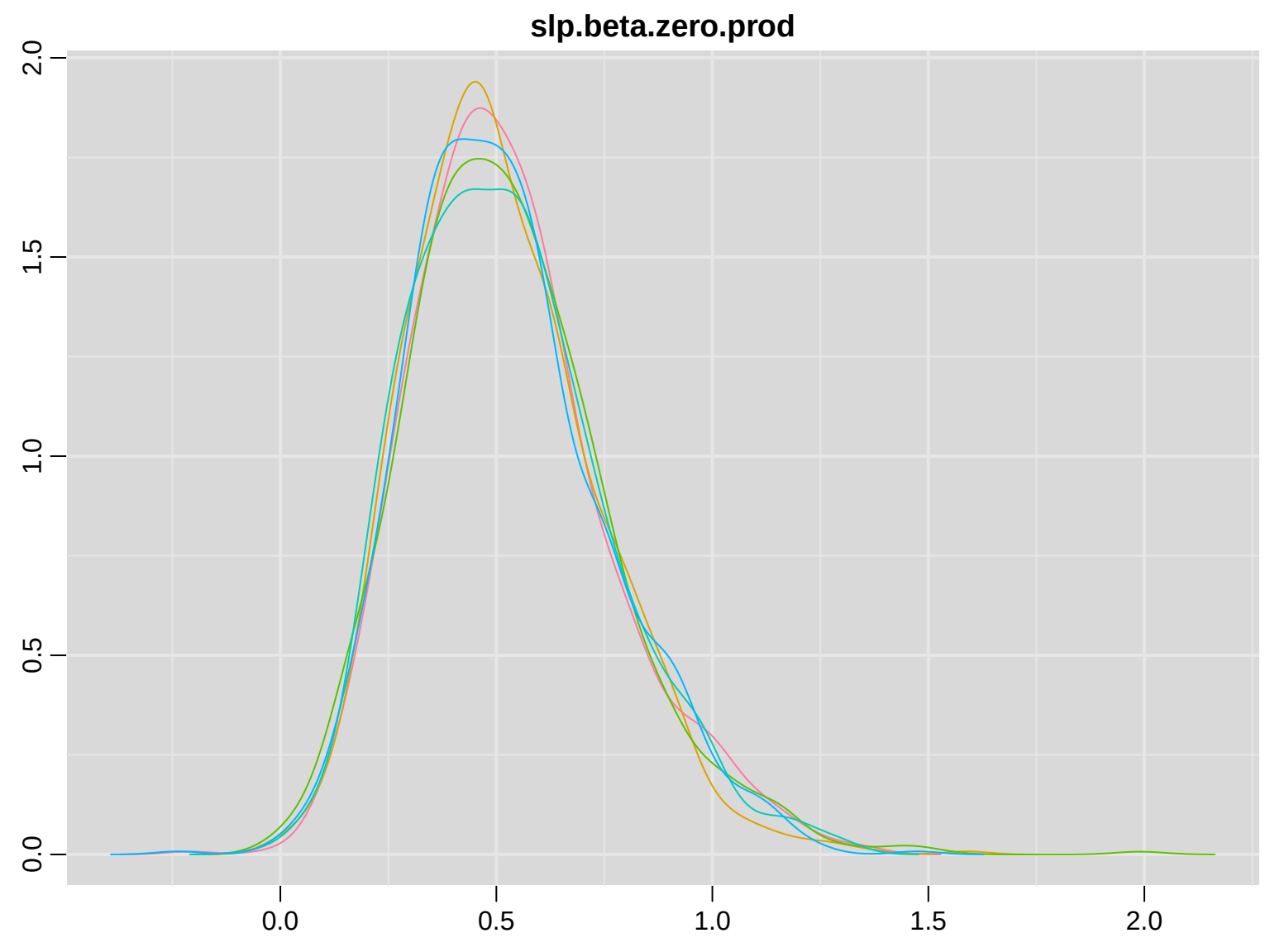

Salcha
salcha.discharge
ice.tanana
temp.incub
temp.juvi
ice.yukon
wind.stress.spring
wind.mixing.june
se.bs.may.sst
arctic.dipole.winter
slp.spring
ice.retreat
winter.prib.temp
m2.fav.wind
slp.winter
npgo
wind.stress.winter
arctic.oscillation
el.nino
alaskan.index
jpn.hat.chum
pink.total
Covariate
0.00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

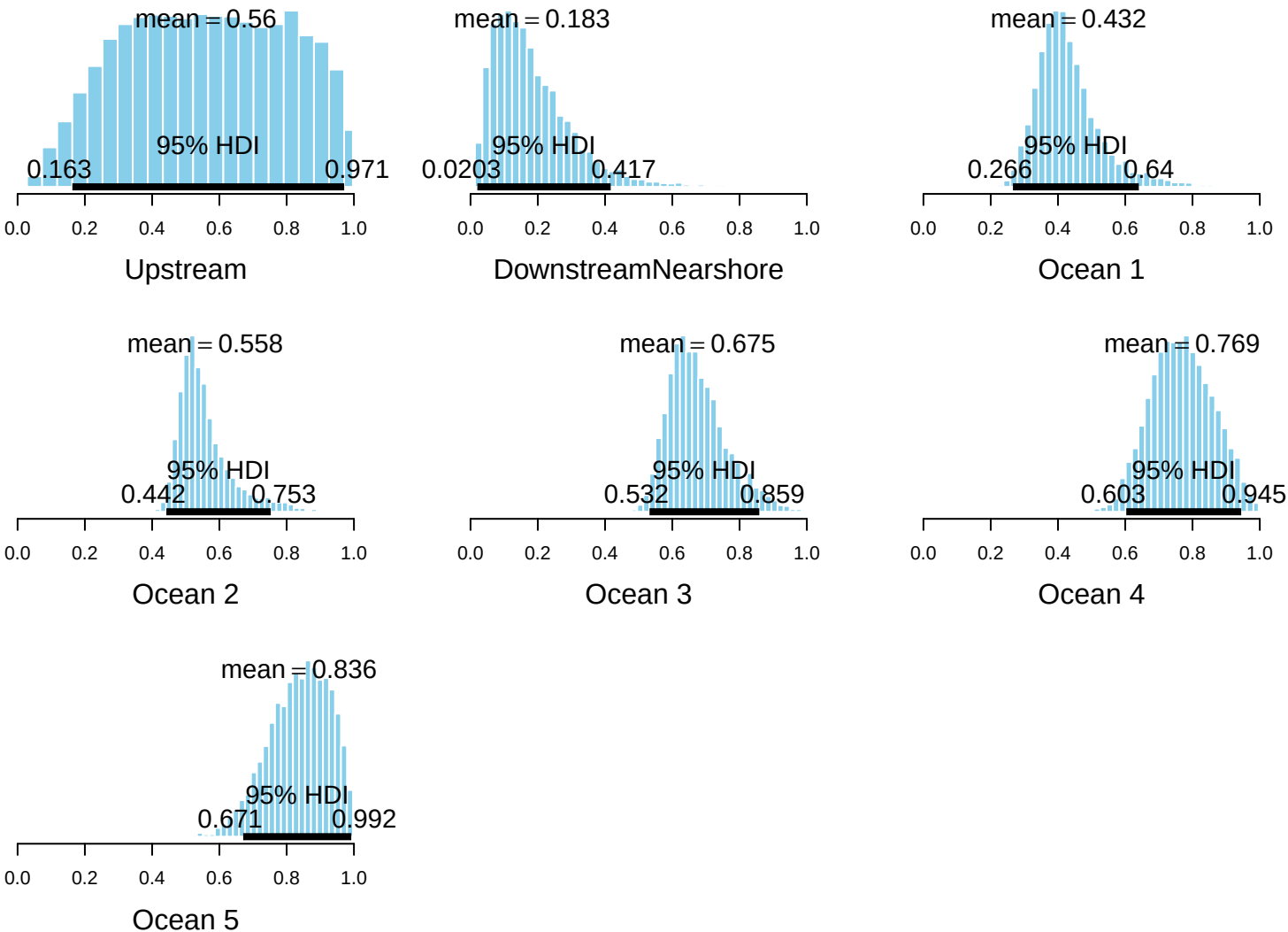

ind.prod[1]
ind.prod[2]
ind.prod[3]
ind.prod[4]
ind.prod[5]
ind.prod[6]
ind.prod[7]
ind.prod[8]
ind.prod[9]
ind.prod[10]
ind.prod[11]
ind.prod[12]
ind.prod[13]
ind.prod[14]
ind.prod[15]
ind.prod[16]
ind.prod[17]
ind.prod[18]
ind.prod[19]
ind.prod[20]
ind.prod[21]
0.0
0.4
0.8
0e+00
2e+05
4e+05

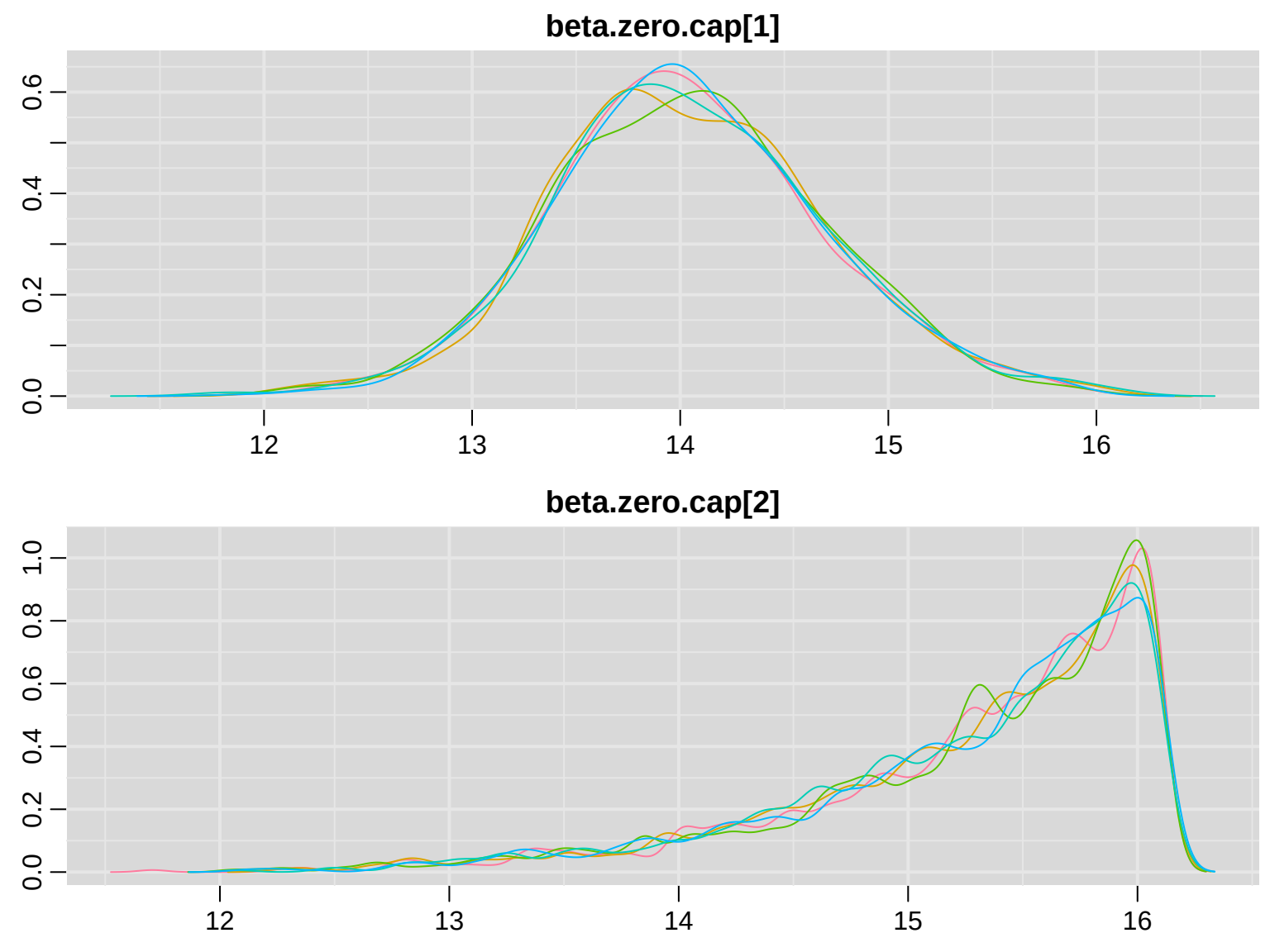

beta.prod[1]
beta.prod[2]
beta.prod[3]
beta.prod[4]
beta.prod[5]
beta.prod[6]
beta.prod[7]
beta.prod[8]
beta.prod[9]
beta.prod[10]
beta.prod[11]
beta.prod[12]
beta.prod[13]
beta.prod[14]
beta.prod[15]
beta.prod[16]
beta.prod[17]
beta.prod[18]
beta.prod[19]
beta.prod[20]
beta.prod[21]

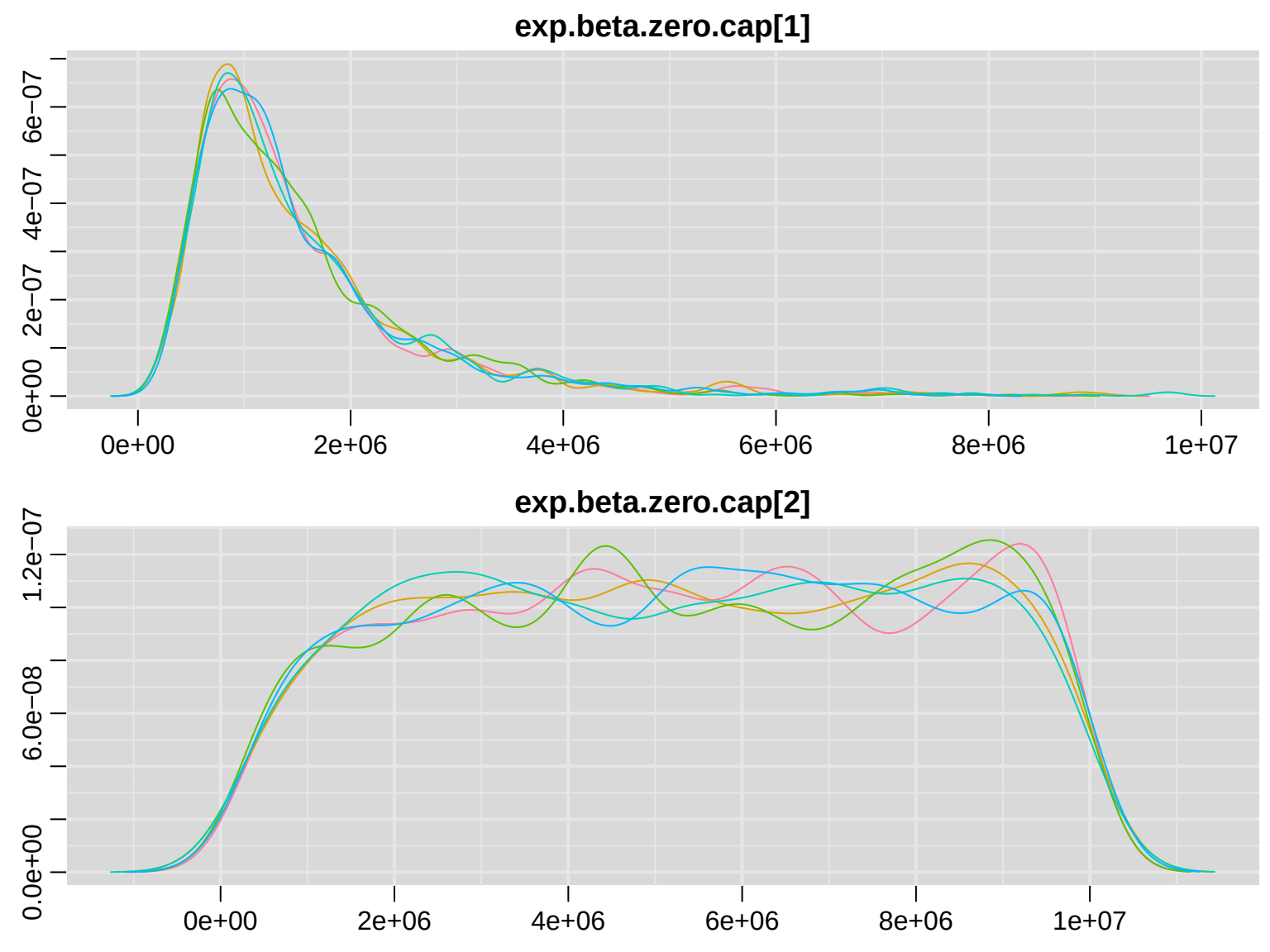

mat.param
0
1
2
3
4
5
2.2
2.3
2.4
2.5
2.6
2.7
2.8

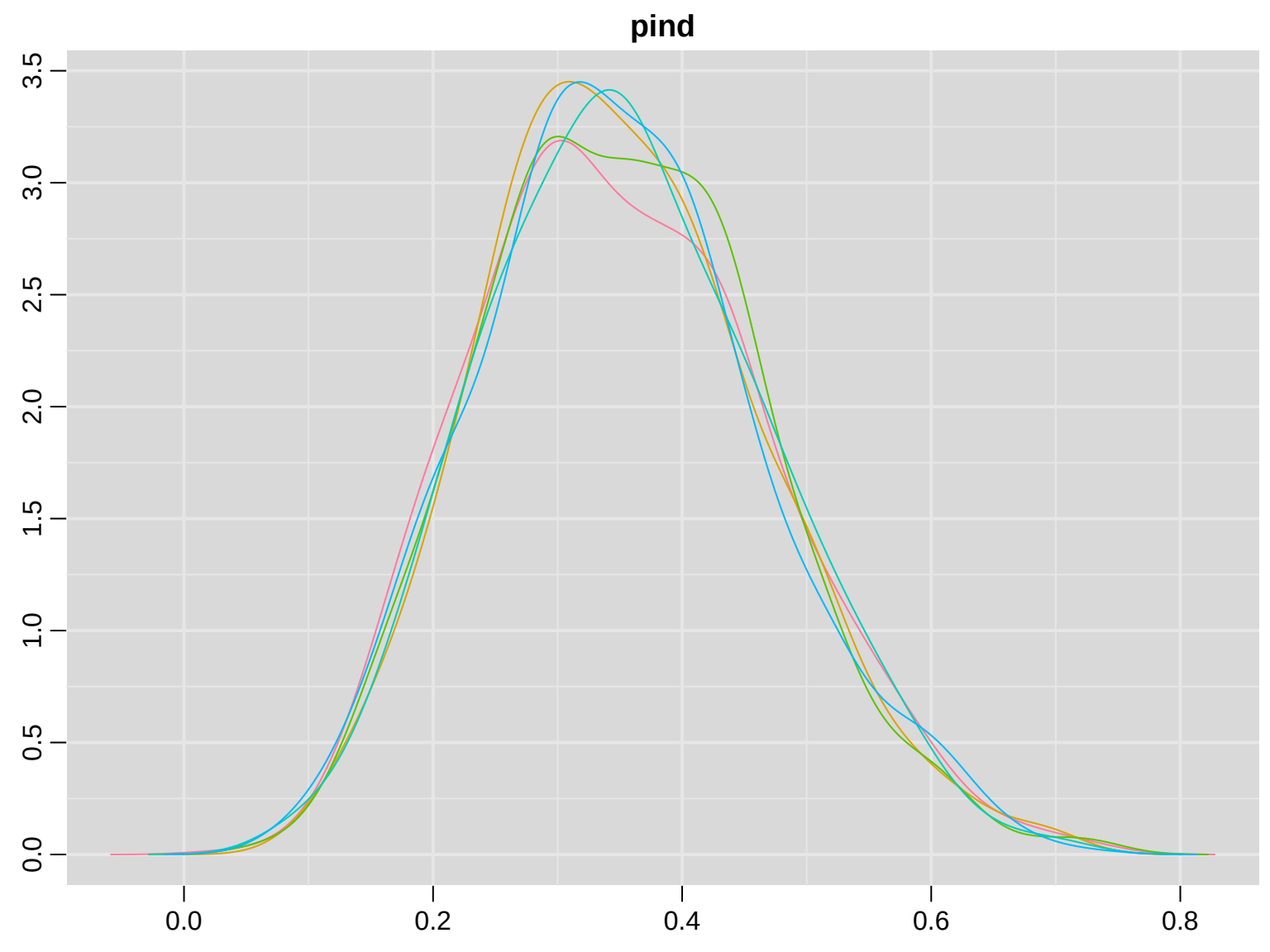

beta.zero.prod[1]
beta.zero.prod[2]
beta.zero.prod[3]
beta.zero.prod[4]
beta.zero.prod[5]
beta.zero.prod[6]
beta.zero.prod[7]

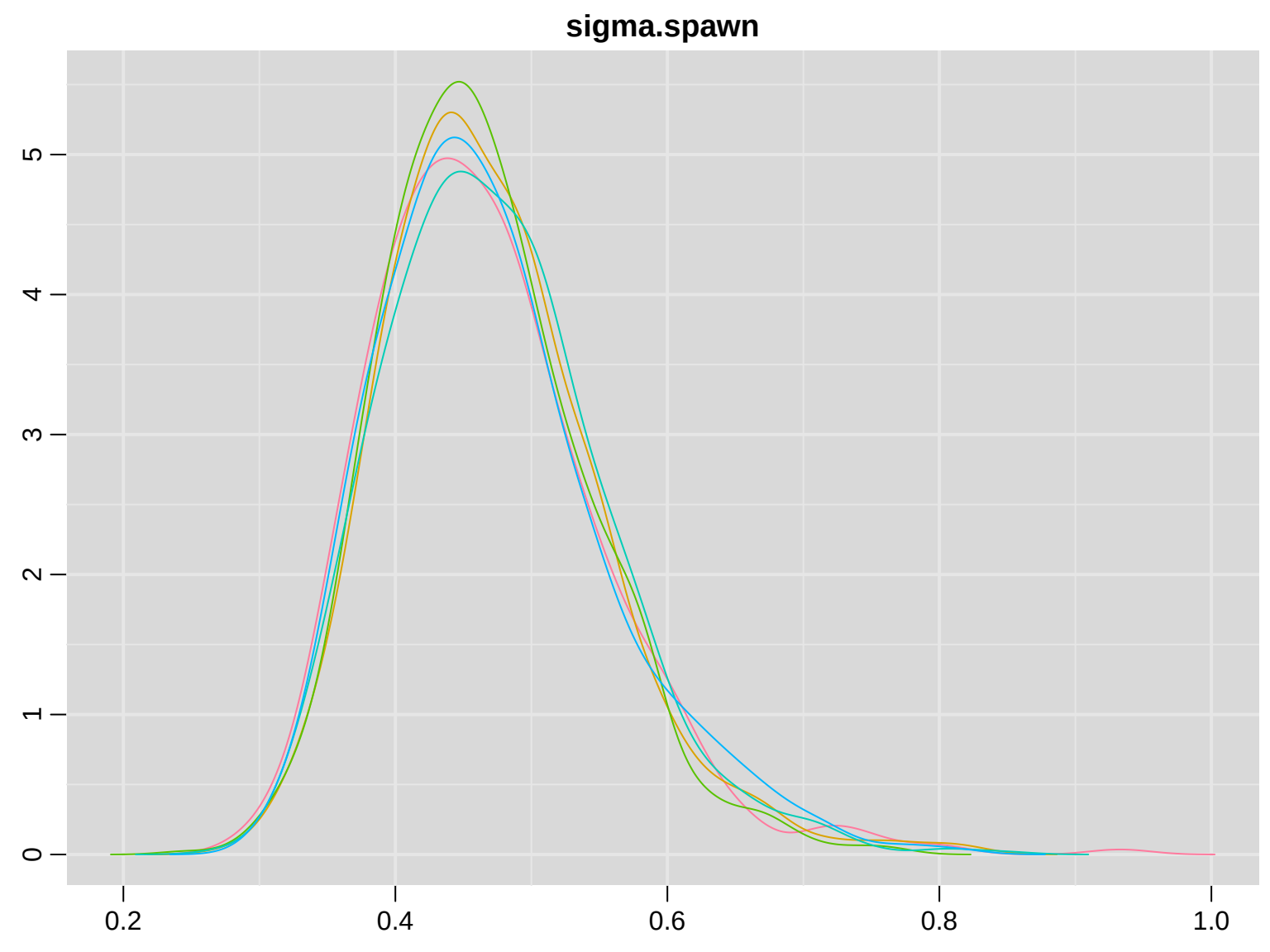

slp.beta.zero.prod
2.0
1.5
1.0
0.5
0.0
0.0
0.5
1.0
1.5
2.0

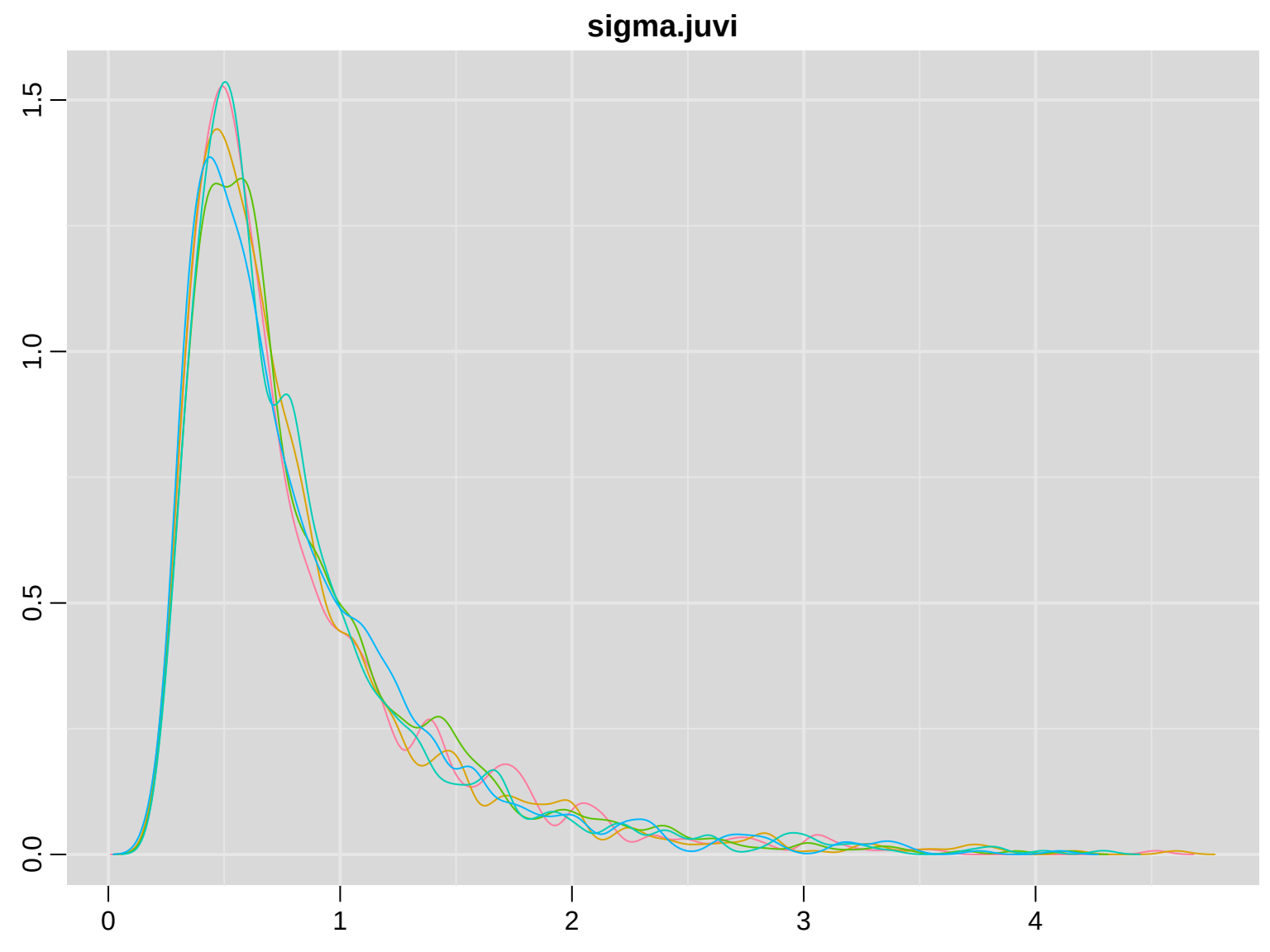

BASELINE SURVIVAL: inv.logit(Beta Zero Prod)
mean = 0.56
95% HDI
0.163
0.971
0.0 0.2 0.4 0.6 0.8 1.0
Upstream
mean = 0.183
95% HDI
0.0203
0.417
0.0 0.2 0.4 0.6 0.8 1.0
DownstreamNearshore
mean = 0.432
95% HDI
0.266
0.64
0.0 0.2 0.4 0.6 0.8 1.0
Ocean 1
mean = 0.558
95% HDI
0.442
0.753
0.0 0.2 0.4 0.6 0.8 1.0
Ocean 2
mean = 0.675
95% HDI
0.532
0.859
0.0 0.2 0.4 0.6 0.8 1.0
Ocean 3
mean = 0.769
95% HDI
0.603
0.945
0.0 0.2 0.4 0.6 0.8 1.0
Ocean 4
mean = 0.836
95% HDI
0.671
0.992
0.0 0.2 0.4 0.6 0.8 1.0
Ocean 5

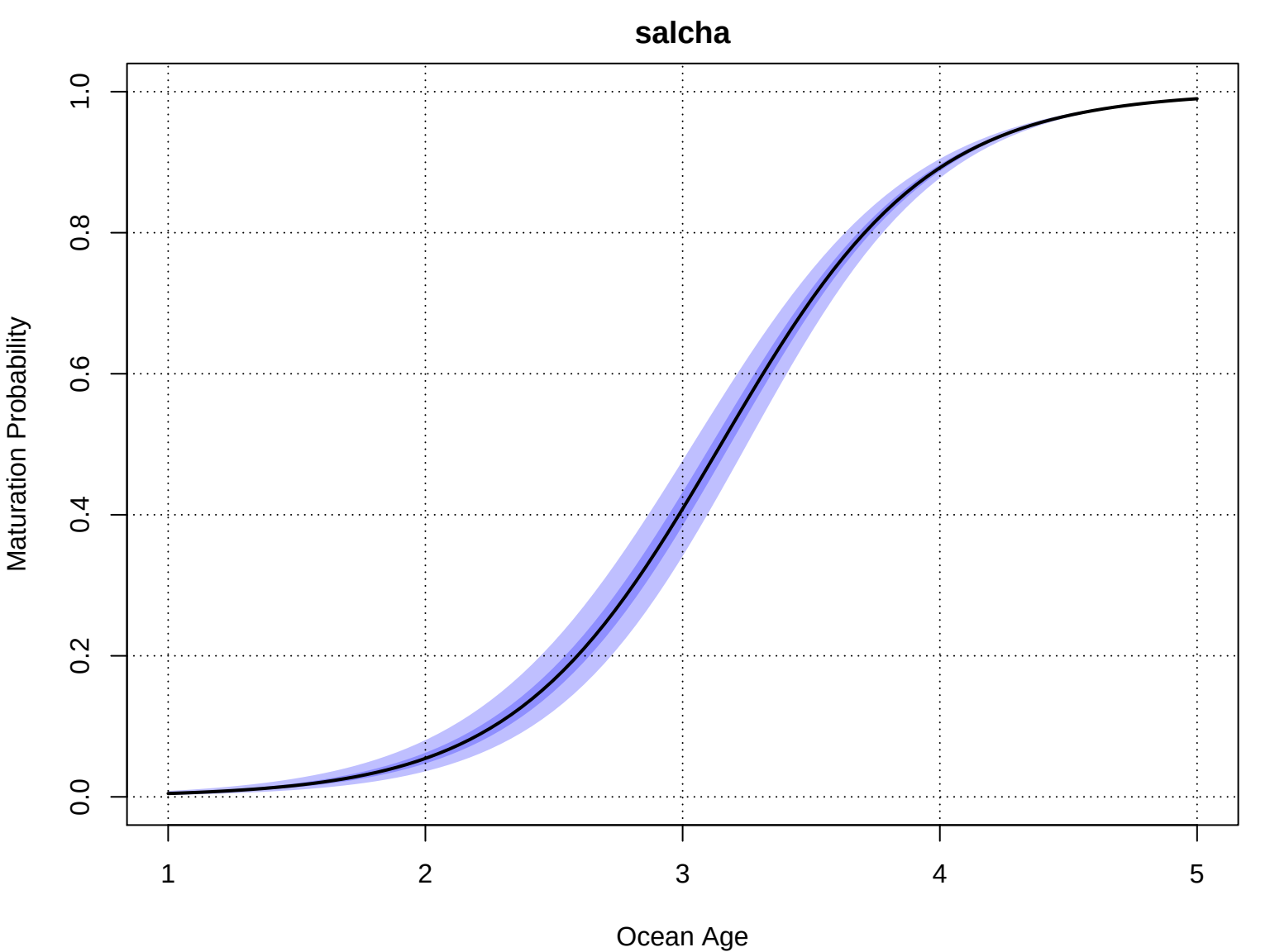

beta.zero.cap[1]
0.0
0.2
0.4
0.6
12
13
14
15
16
beta.zero.cap[2]
0.0
0.2
0.4
0.6
0.8
1.0
12
13
14
15
16

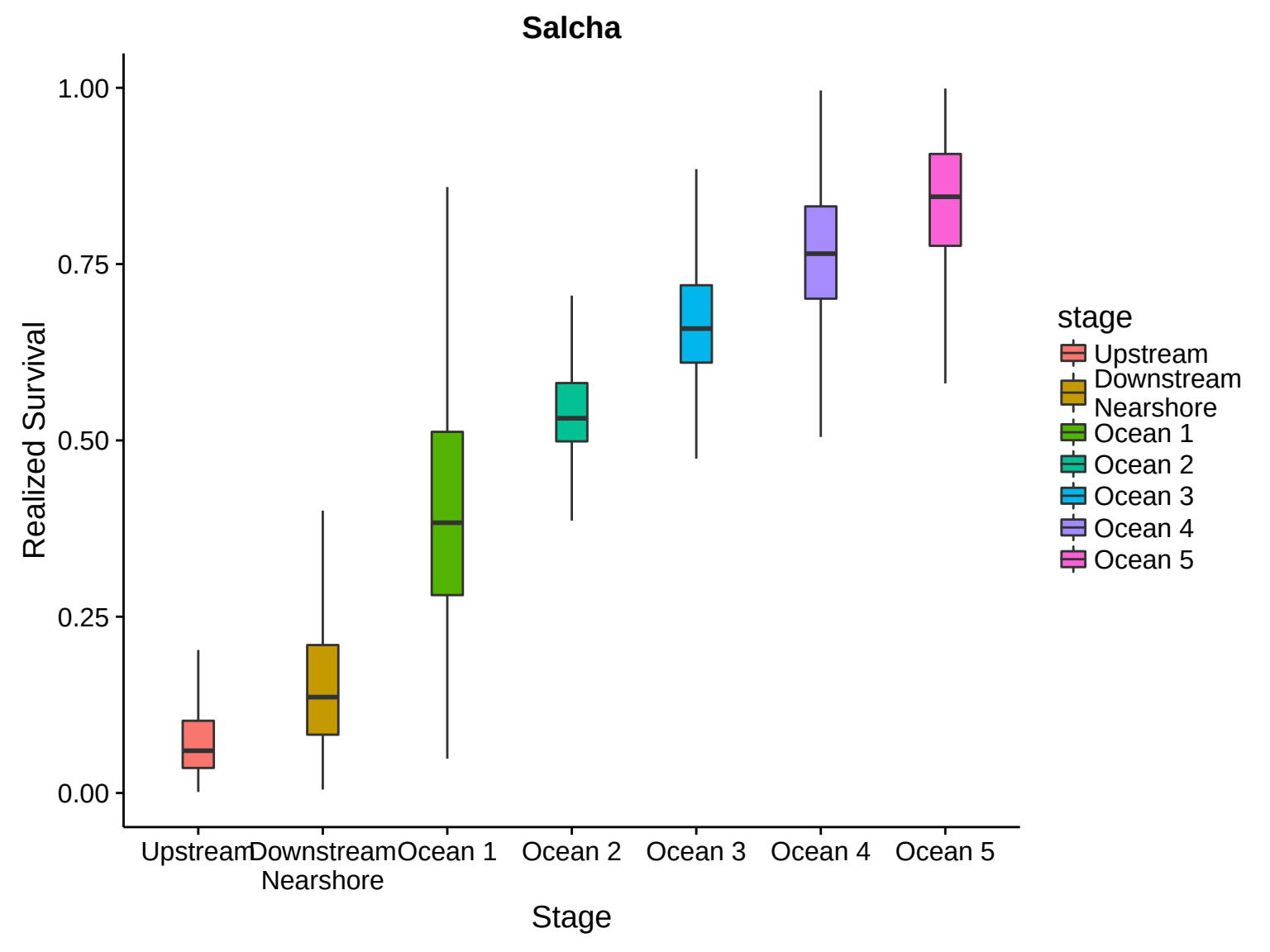

exp.beta.zero.cap[1]
0e+00
2e−07
4e−07
6e−07
0e+00
2e+06
4e+06
6e+06
8e+06
1e+07
exp.beta.zero.cap[2]
0.0e+00
6.0e−08
1.2e−07
0e+00
2e+06
4e+06
6e+06
8e+06
1e+07

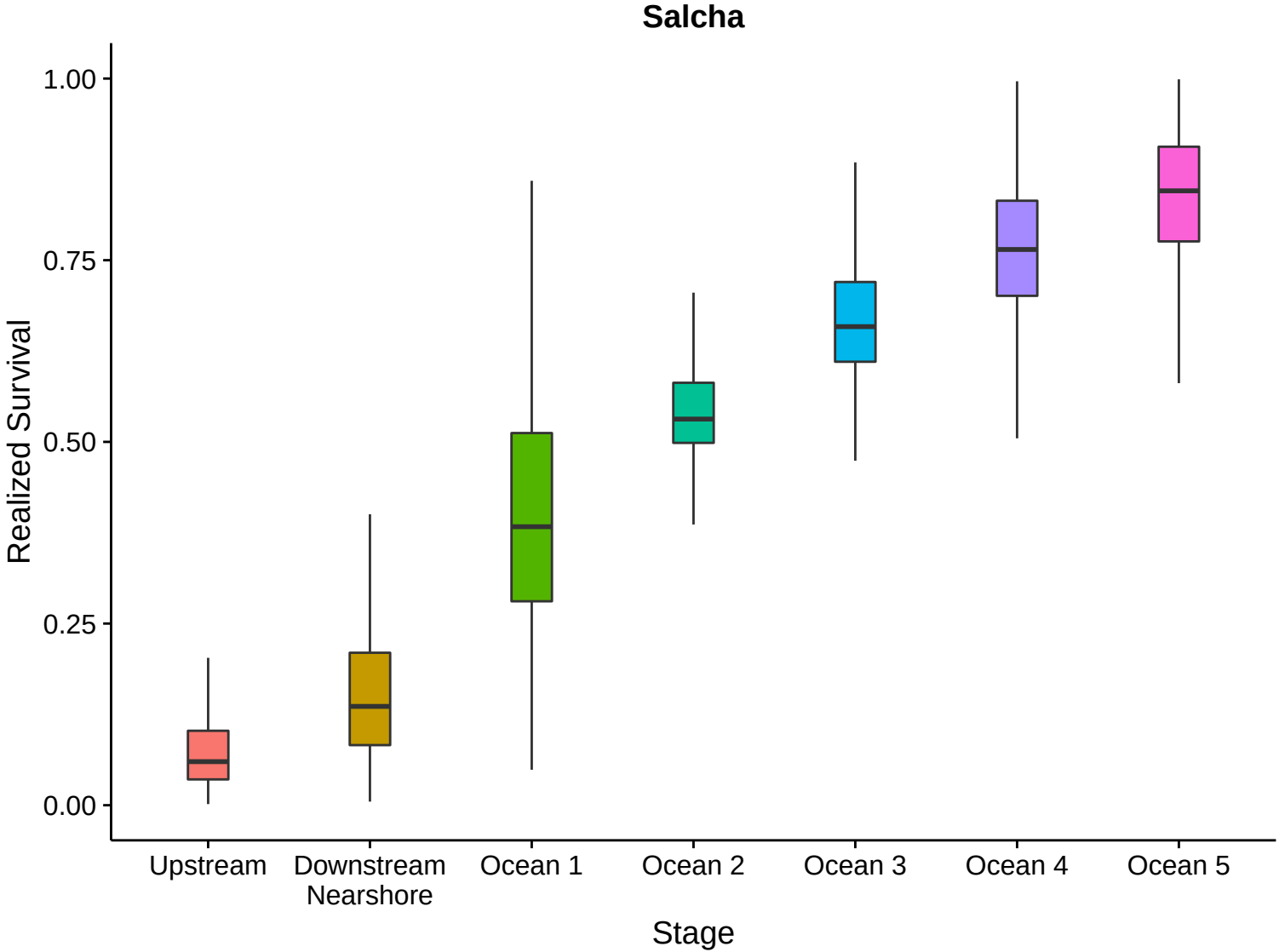

pind
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
0.0
0.2
0.4
0.6
0.8

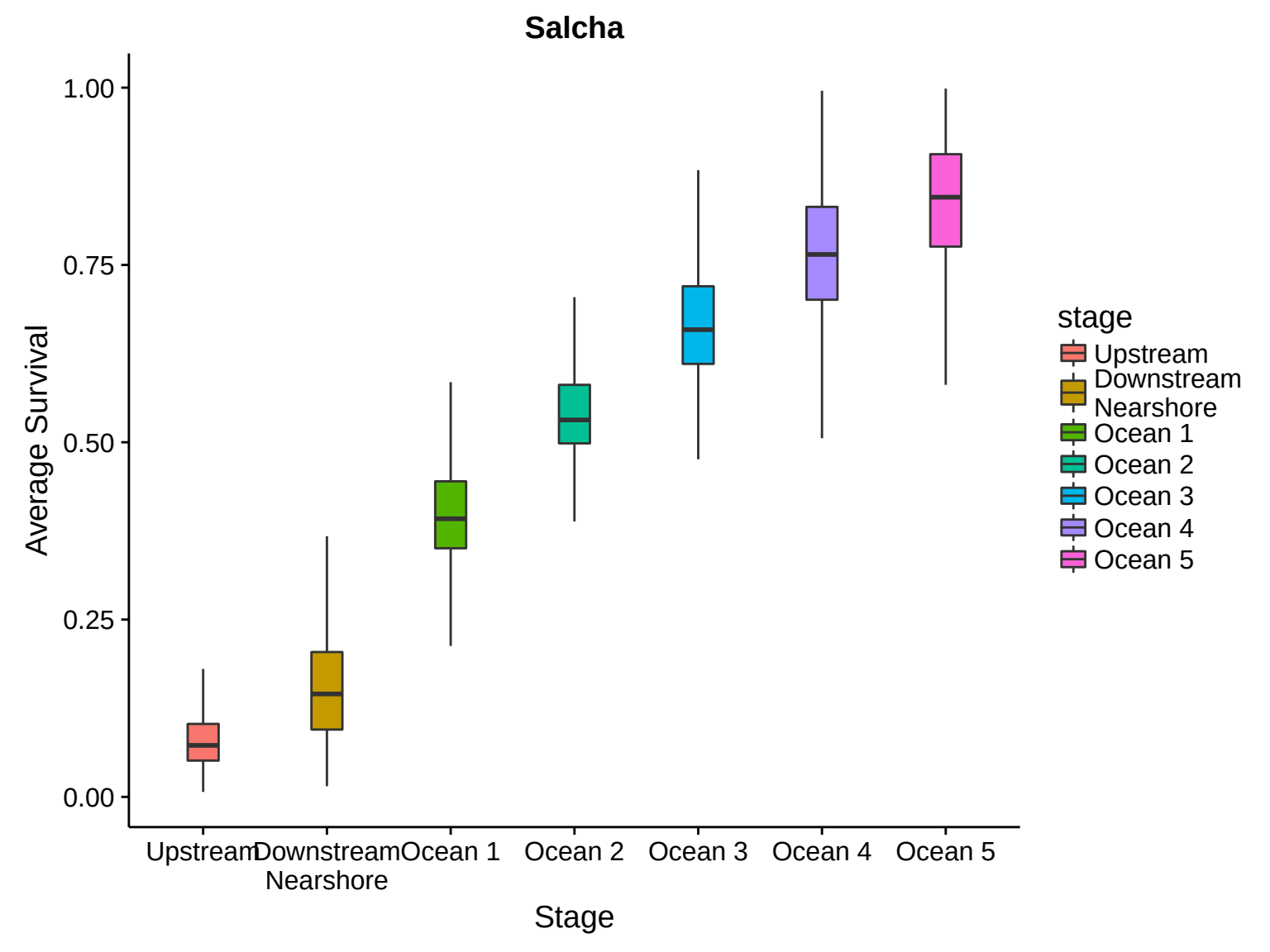

sigma.spawn
0
1
2
3
4
5
0.2
0.4
0.6
0.8
1.0

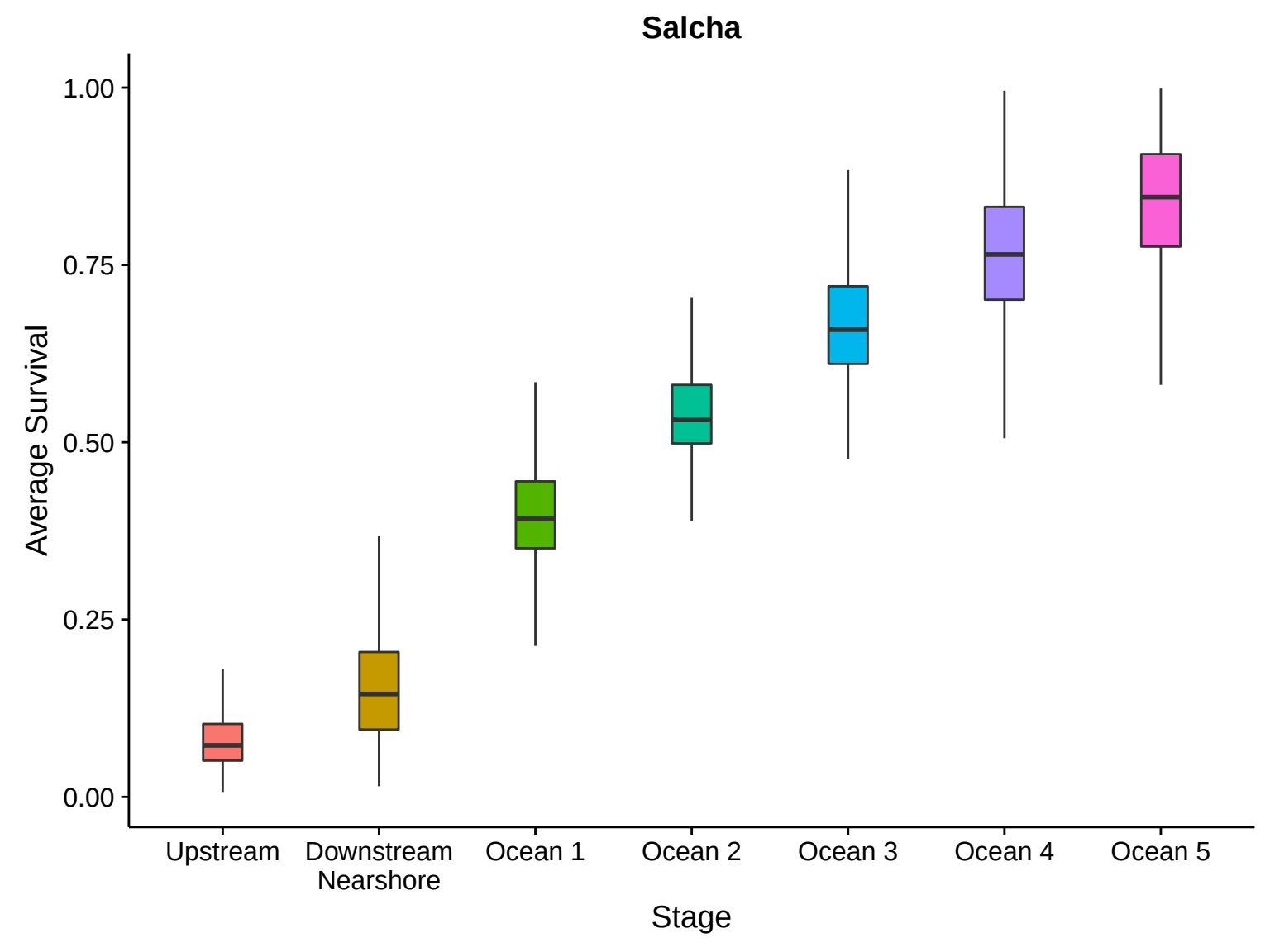

sigma.juvi
0.0
0.5
1.0
1.5
0
1
2
3
4

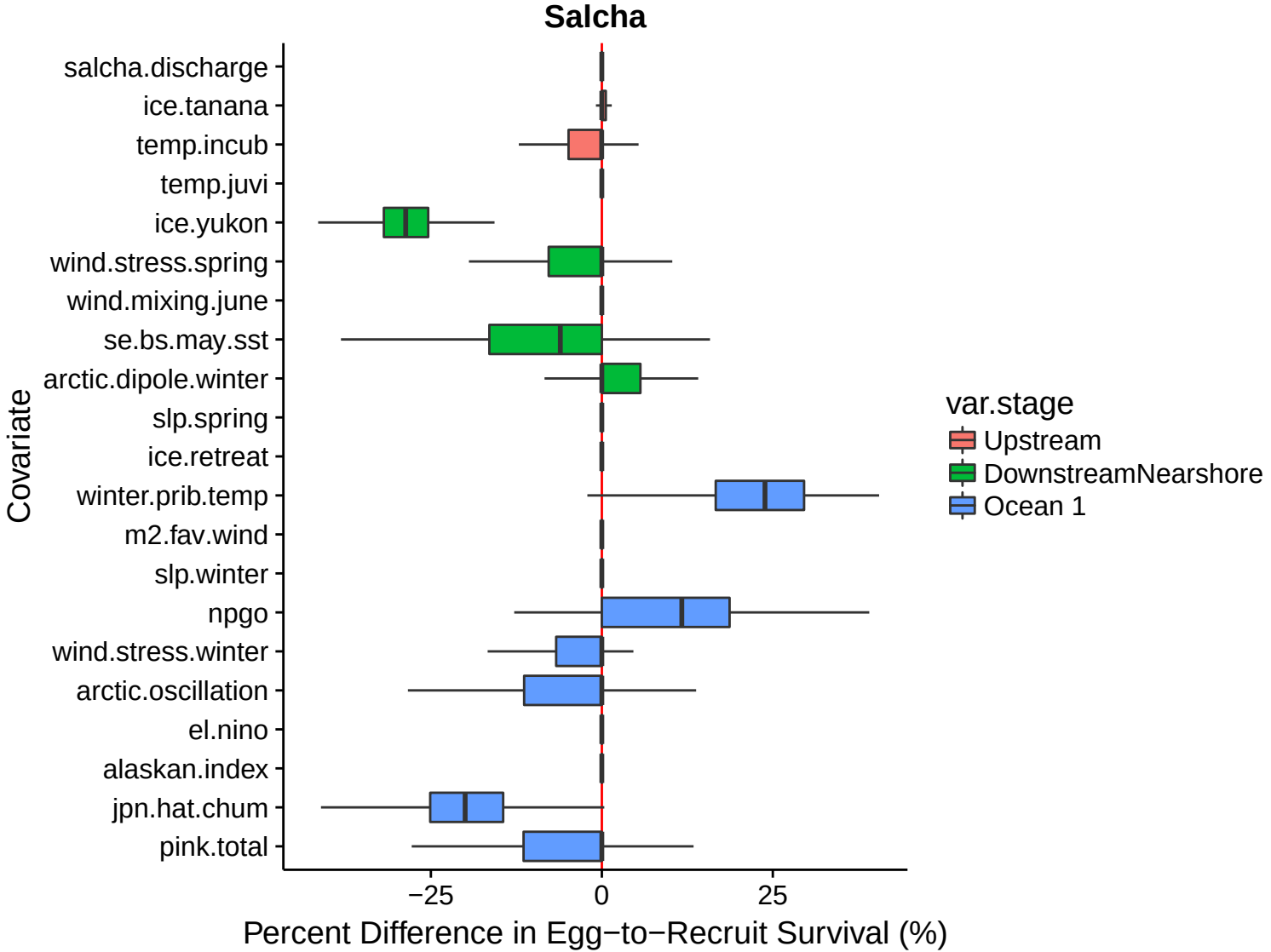

salcha
Maturation Probability
0.0
0.2
0.4
0.6
0.8
1.0
1
2
3
4
5
Ocean Age

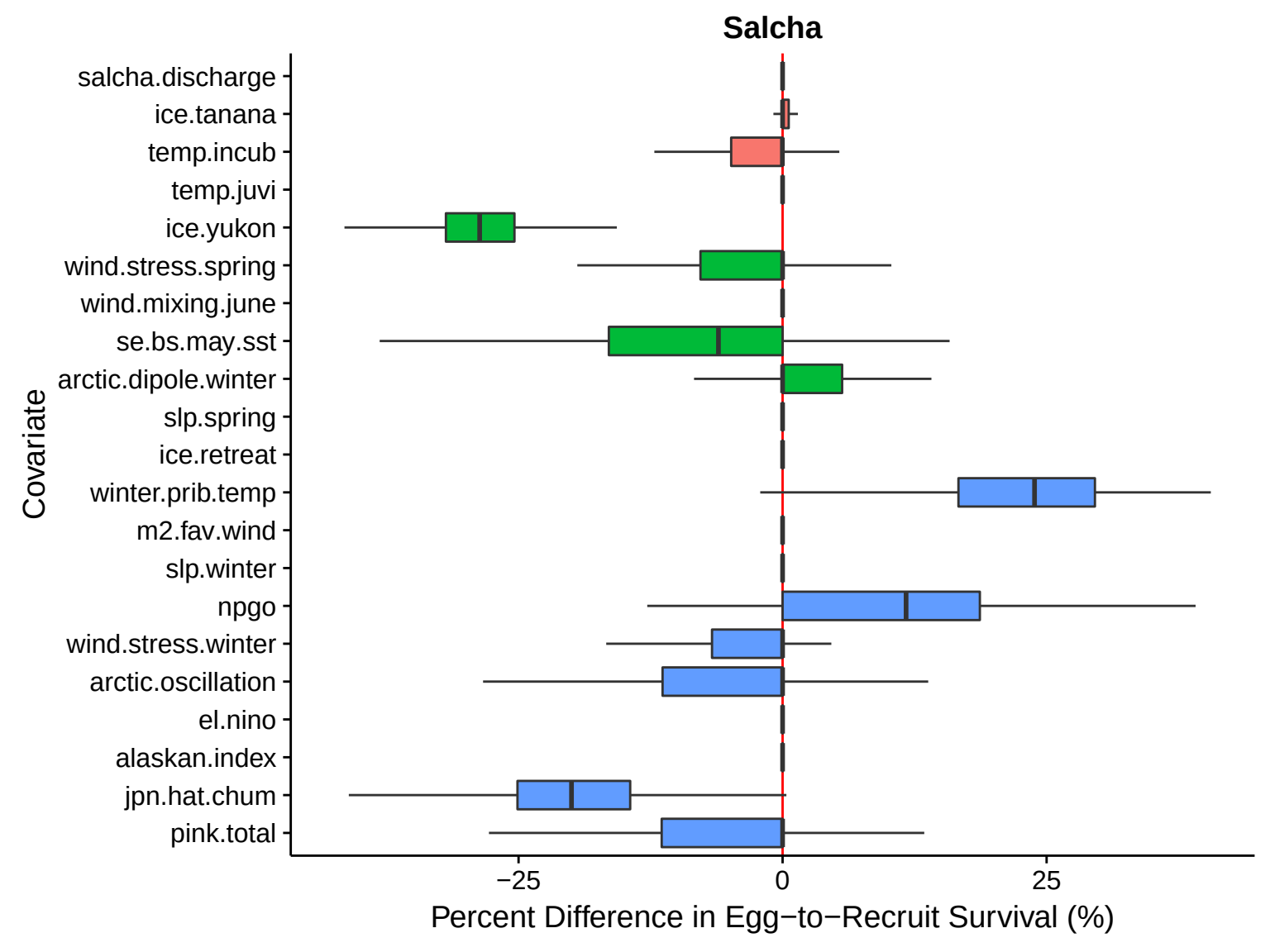

Salcha
1.00
0.75
0.50
0.25
0.00
Realized Survival
Upstream
Downstream
Nearshore
Ocean 1
Ocean 2
Ocean 3
Ocean 4
Ocean 5
Stage
stage
Upstream
Downstream
Nearshore
Ocean 1
Ocean 2
Ocean 3
Ocean 4
Ocean 5

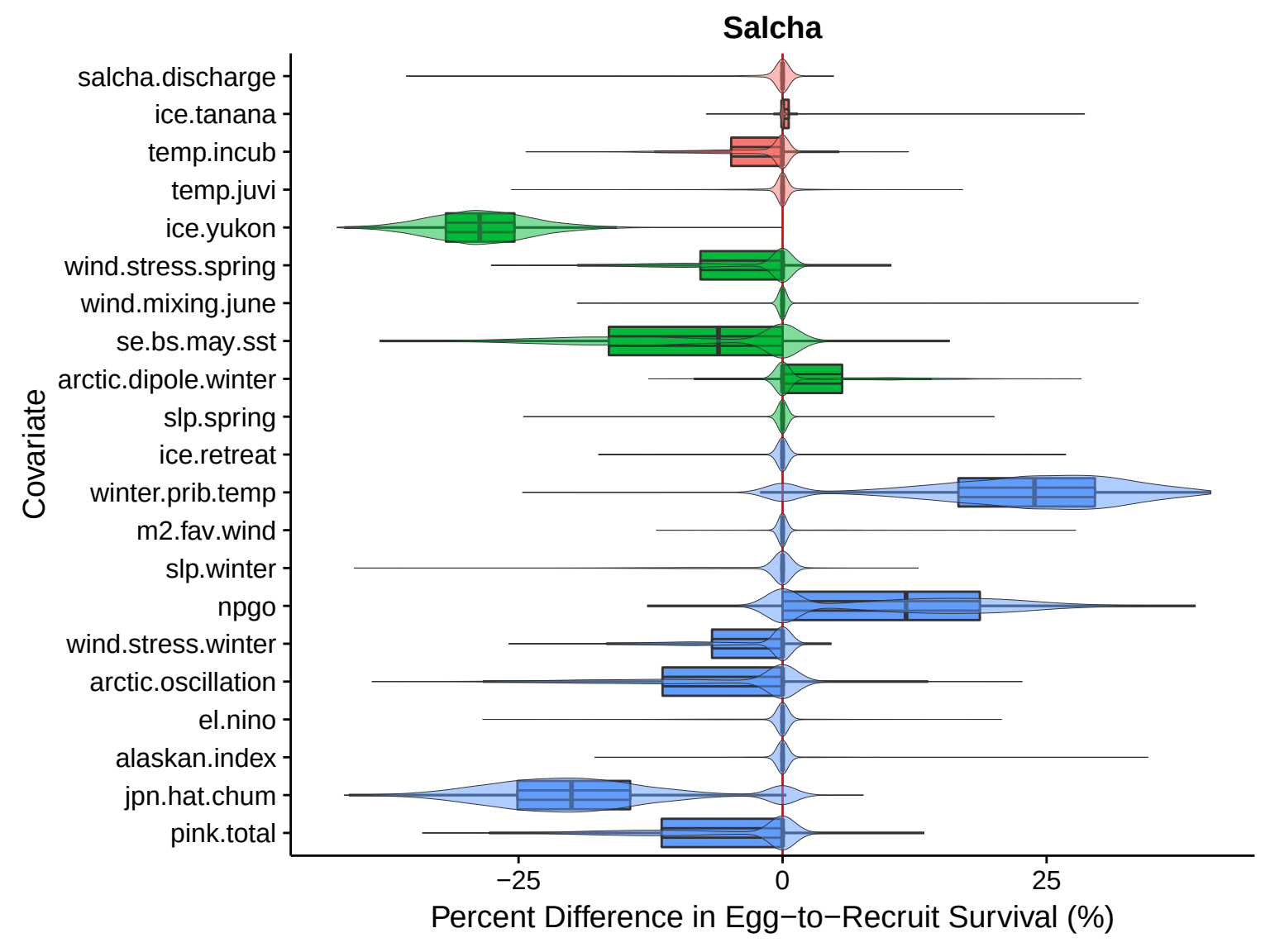

Salcha
1.00
0.75
0.50
0.25
0.00
Realized Survival
Upstream
Downstream
Nearshore
Ocean 1
Ocean 2
Ocean 3
Ocean 4
Ocean 5
Stage

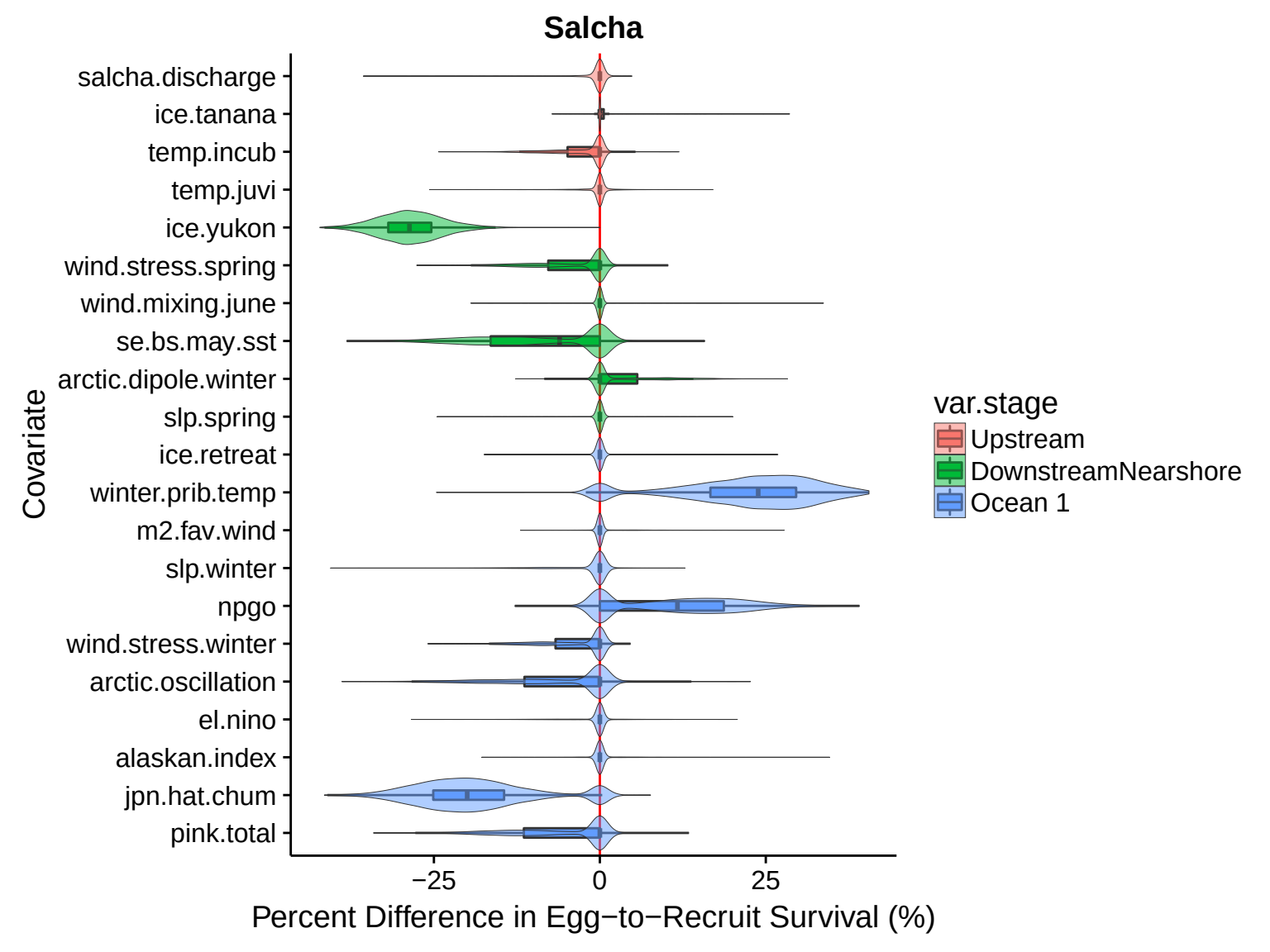

Salcha
1.00
0.75
0.50
0.25
0.00
Average Survival
Upstream
Downstream
Nearshore
Ocean 1
Ocean 2
Ocean 3
Ocean 4
Ocean 5
Stage
stage
Upstream
Downstream
Nearshore
Ocean 1
Ocean 2
Ocean 3
Ocean 4
Ocean 5

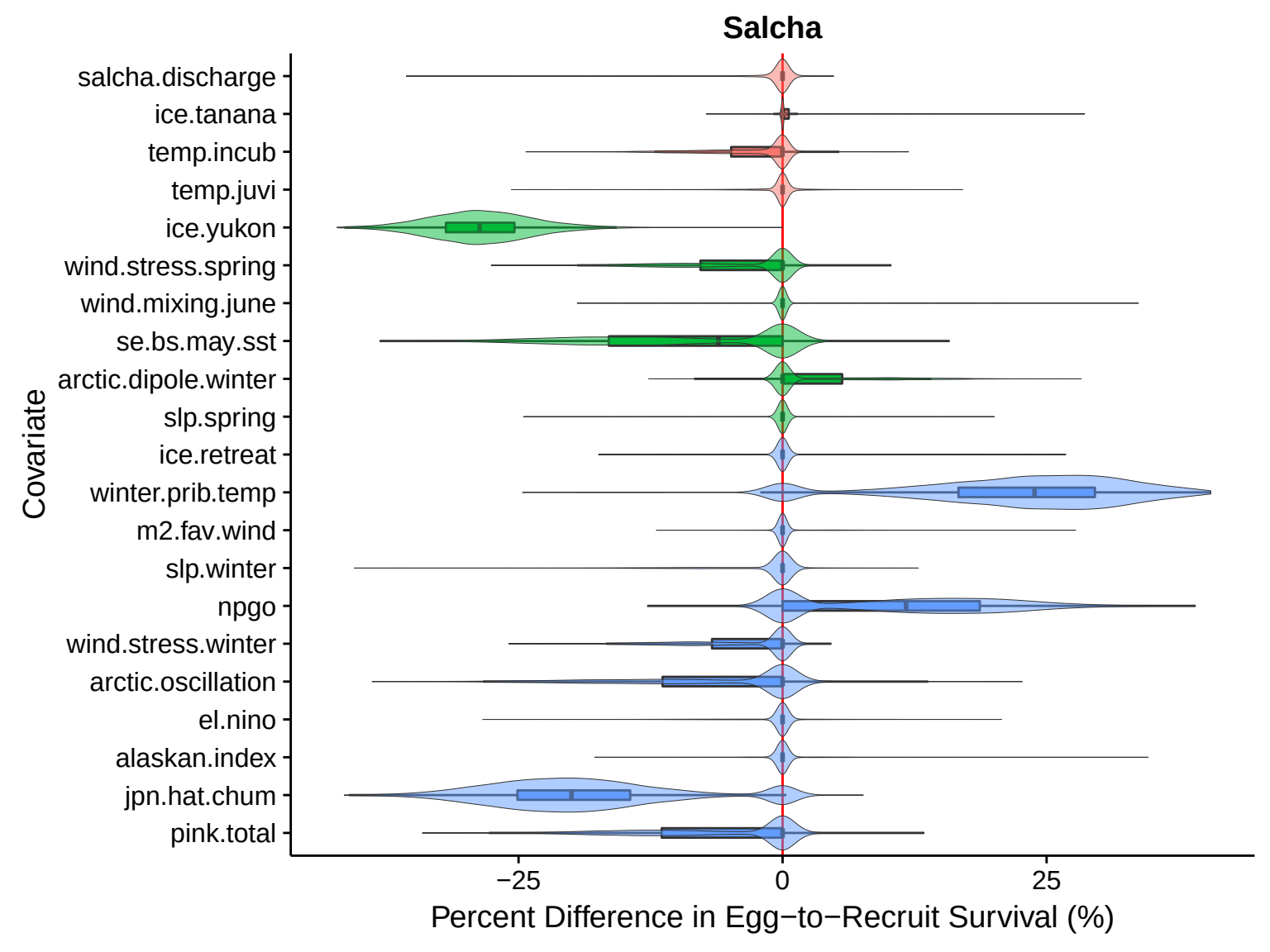

Salcha
1.00
0.75
0.50
0.25
0.00
Average Survival
Upstream
Downstream
Nearshore
Ocean 1
Ocean 2
Ocean 3
Ocean 4
Ocean 5
Stage

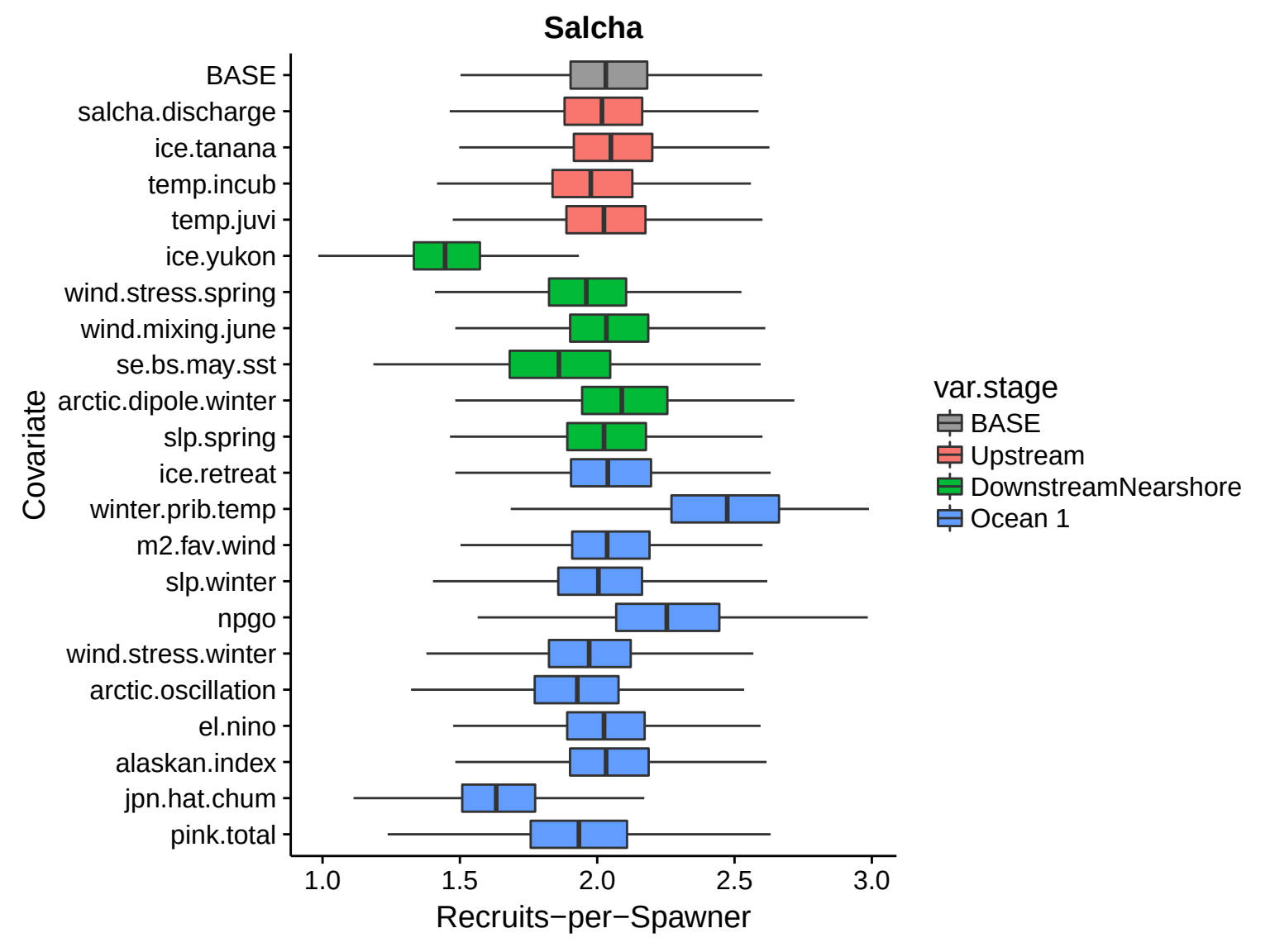

Salcha
salcha.discharge
ice.tanana
temp.incub
temp.juvi
ice.yukon
wind.stress.spring
wind.mixing.june
se.bs.may.sst
arctic.dipole.winter
slp.spring
ice.retreat
winter.prib.temp
m2.fav.wind
slp.winter
npgo
wind.stress.winter
arctic.oscillation
el.nino
alaskan.index
jpn.hat.chum
pink.total
Covariate
−25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

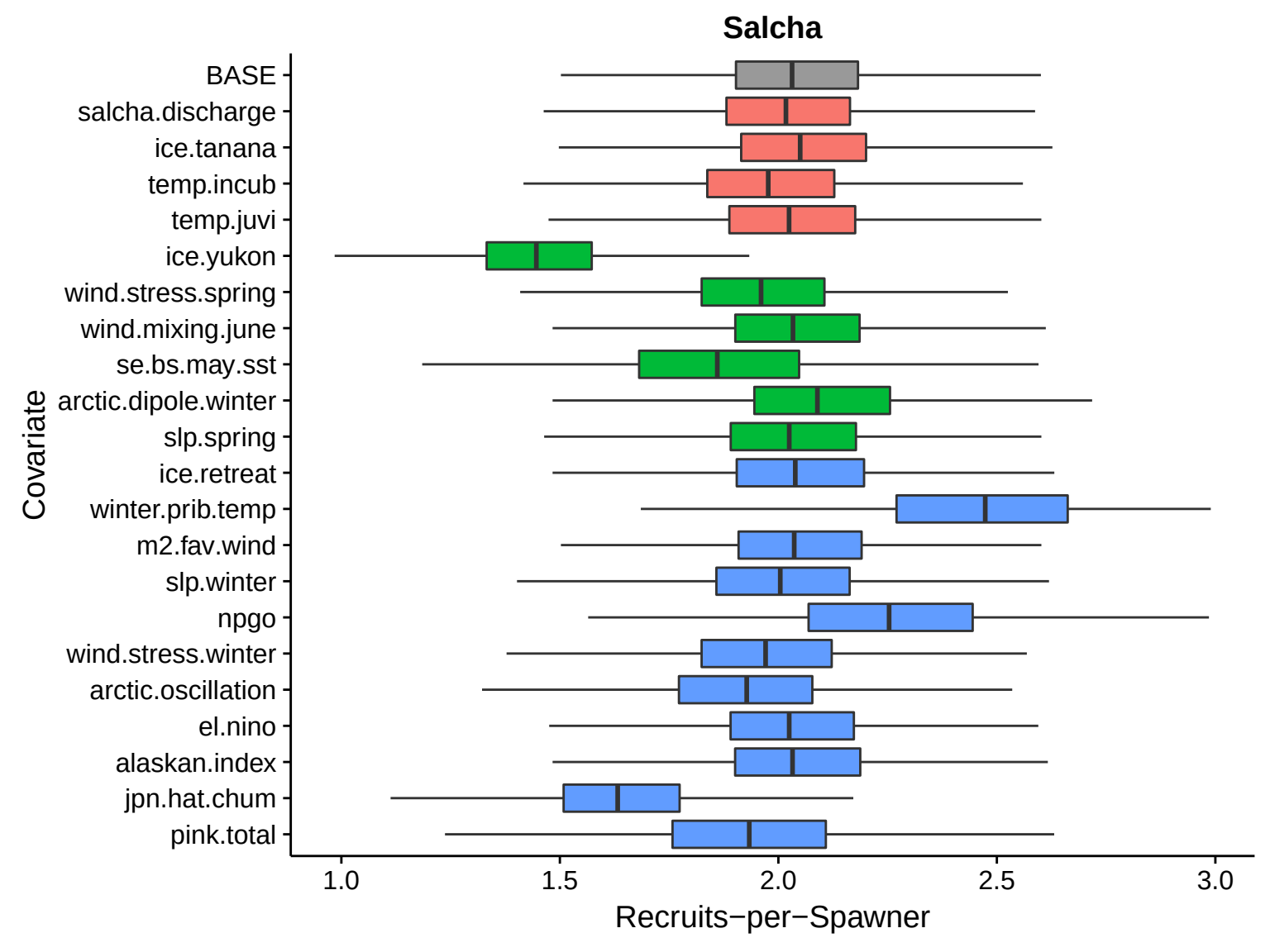

Salcha
salcha.discharge
ice.tanana
temp.incub
temp.juvi
ice.yukon
wind.stress.spring
wind.mixing.june
se.bs.may.sst
arctic.dipole.winter
slp.spring
ice.retreat
winter.prib.temp
m2.fav.wind
slp.winter
npgo
wind.stress.winter
arctic.oscillation
el.nino
alaskan.index
jpn.hat.chum
pink.total
Covariate
−25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

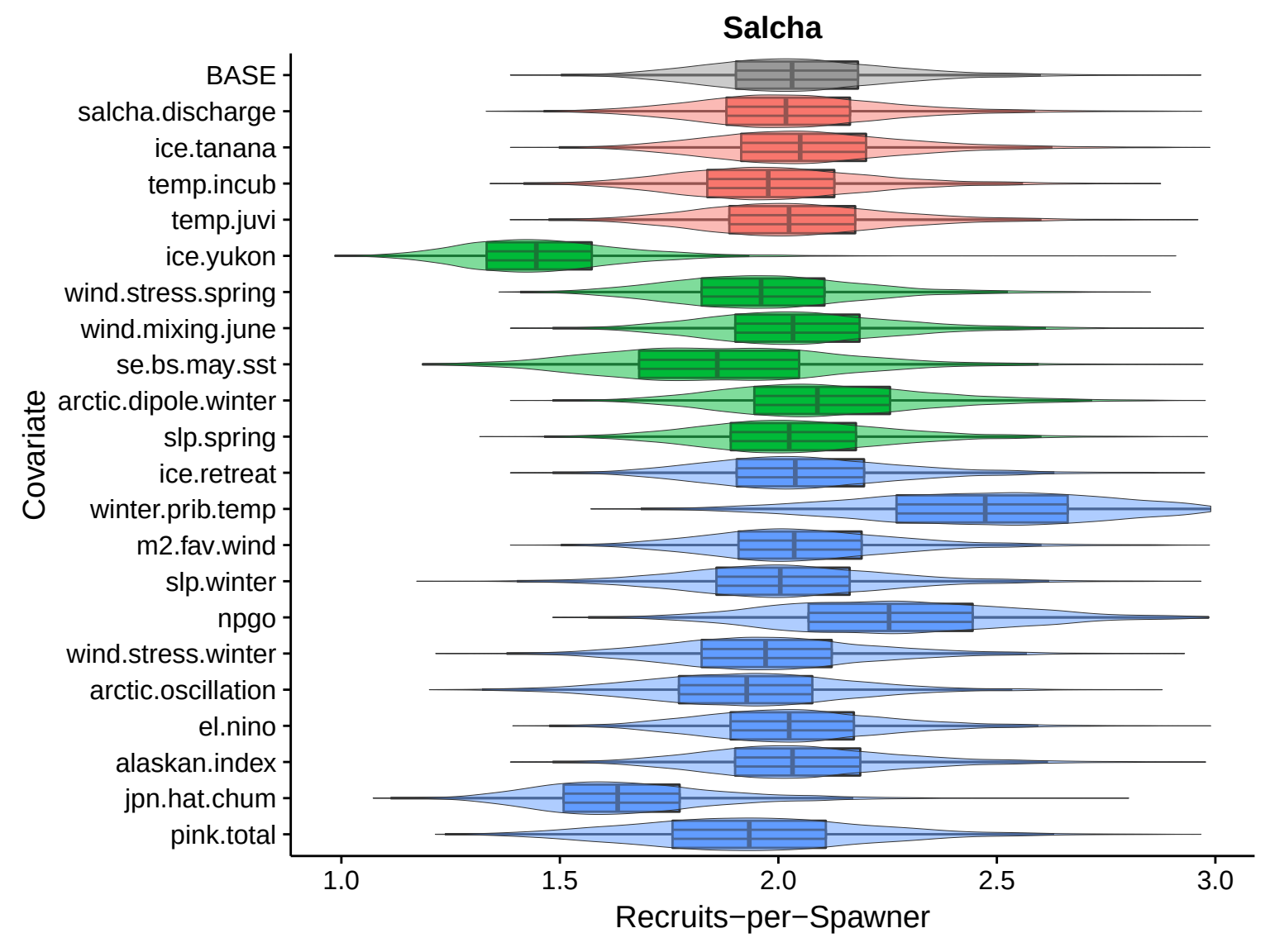

Salcha
salcha.discharge
ice.tanana
temp.incub
temp.juvi
ice.yukon
wind.stress.spring
wind.mixing.june
se.bs.may.sst
arctic.dipole.winter
slp.spring
ice.retreat
winter.prib.temp
m2.fav.wind
slp.winter
npgo
wind.stress.winter
arctic.oscillation
el.nino
alaskan.index
jpn.hat.chum
pink.total
Covariate
−25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

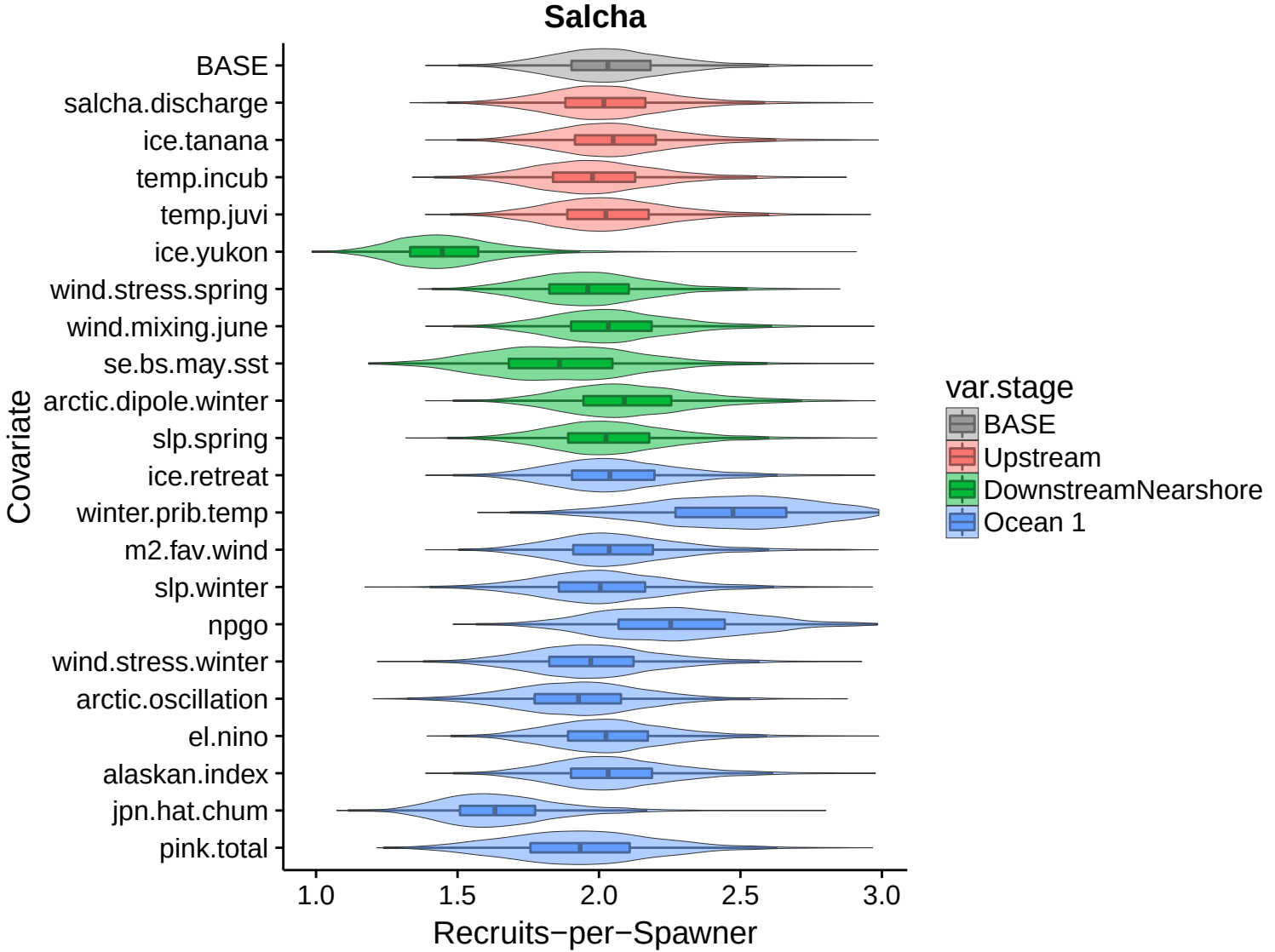

Salcha
salcha.discharge
ice.tanana
temp.incub
temp.juvi
ice.yukon
wind.stress.spring
wind.mixing.june
se.bs.may.sst
arctic.dipole.winter
slp.spring
ice.retreat
winter.prib.temp
m2.fav.wind
slp.winter
npgo
wind.stress.winter
arctic.oscillation
el.nino
alaskan.index
jpn.hat.chum
pink.total
Covariate
−25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

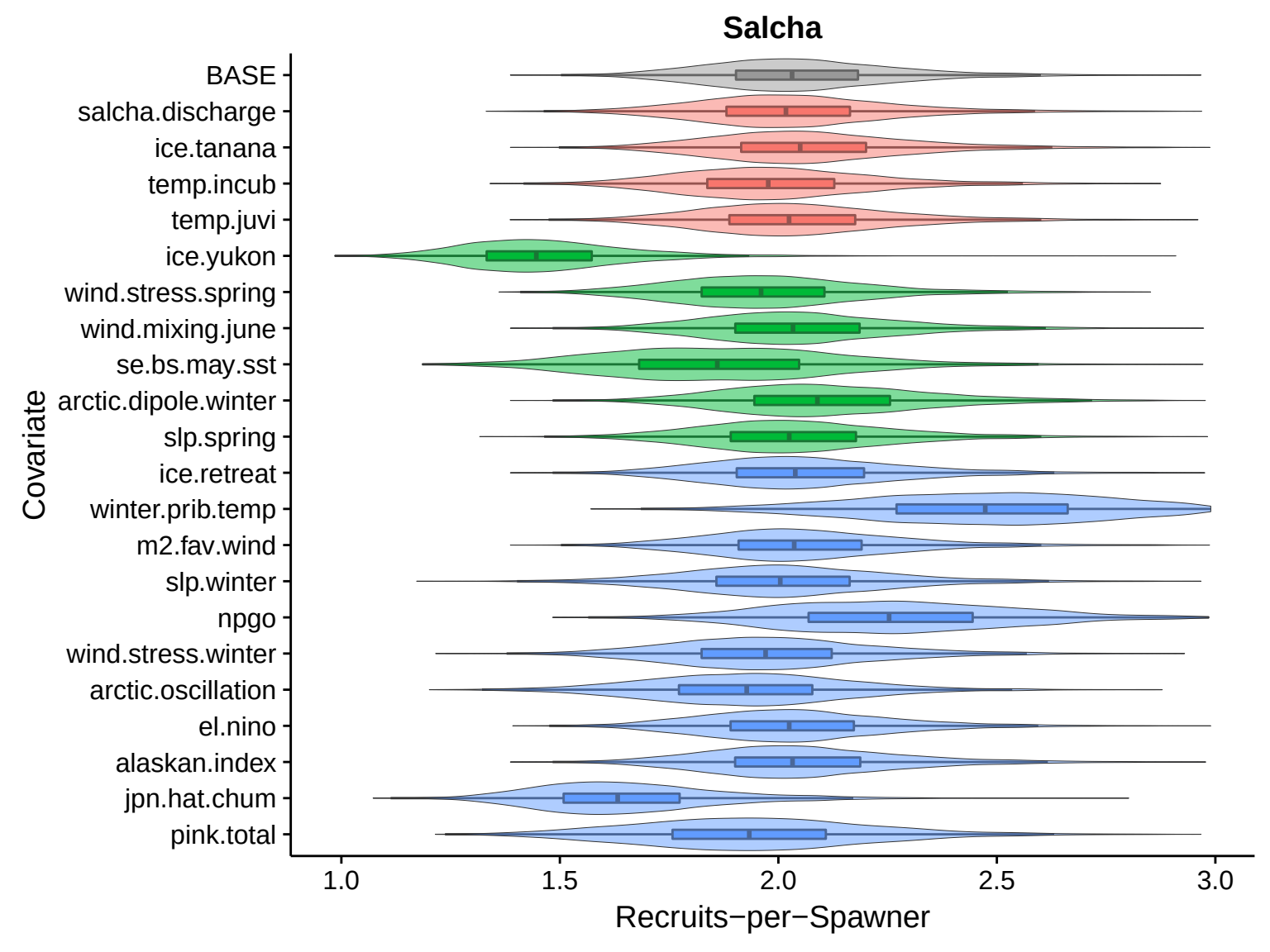

Salcha
salcha.discharge
ice.tanana
temp.incub
temp.juvi
ice.yukon
wind.stress.spring
wind.mixing.june
se.bs.may.sst
arctic.dipole.winter
slp.spring
ice.retreat
winter.prib.temp
m2.fav.wind
slp.winter
npgo
wind.stress.winter
arctic.oscillation
el.nino
alaskan.index
jpn.hat.chum
pink.total
Covariate
−25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

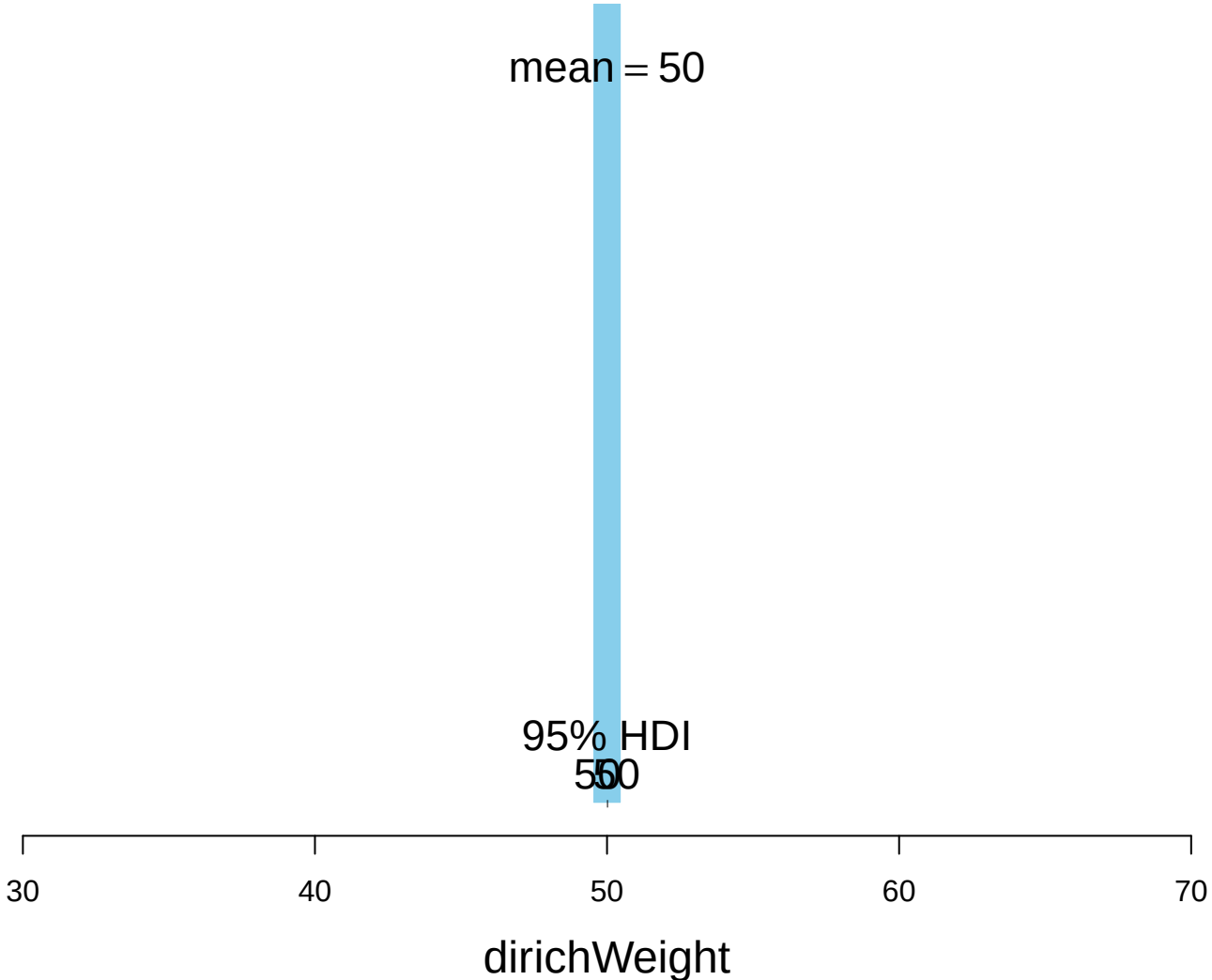

Salcha
BASE
salcha.discharge
ice.tanana
temp.incub
temp.juvi
ice.yukon
wind.stress.spring
wind.mixing.june
se.bs.may.sst
arctic.dipole.winter
slp.spring
ice.retreat
winter.prib.temp
m2.fav.wind
slp.winter
npgo
wind.stress.winter
arctic.oscillation
el.nino
alaskan.index
jpn.hat.chum
pink.total
Covariate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

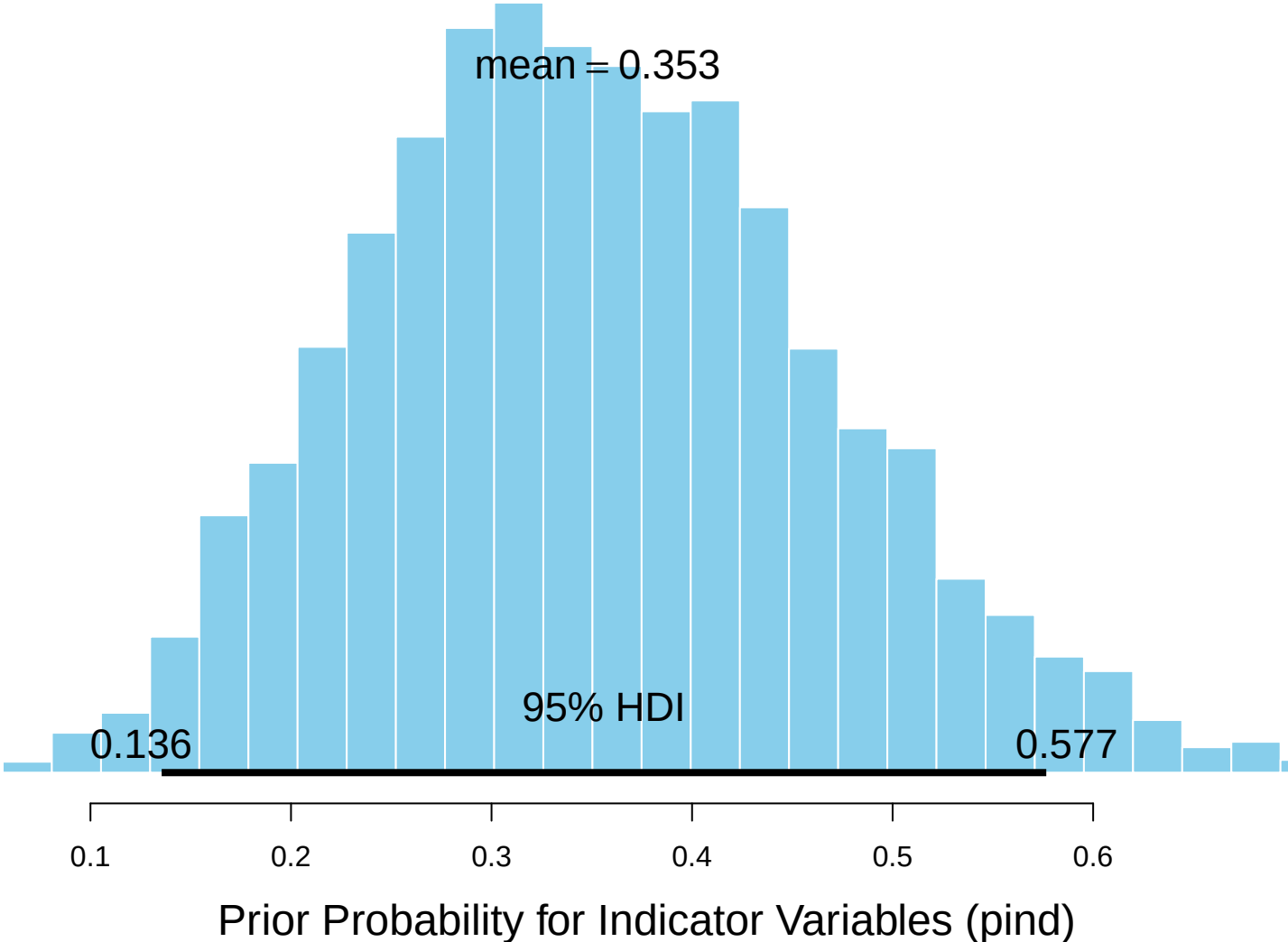

Salcha
BASE
salcha.discharge
ice.tanana
temp.incub
temp.juvi
ice.yukon
wind.stress.spring
wind.mixing.june
se.bs.may.sst
arctic.dipole.winter
slp.spring
ice.retreat
winter.prib.temp
m2.fav.wind
slp.winter
npgo
wind.stress.winter
arctic.oscillation
el.nino
alaskan.index
jpn.hat.chum
pink.total
Covariate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

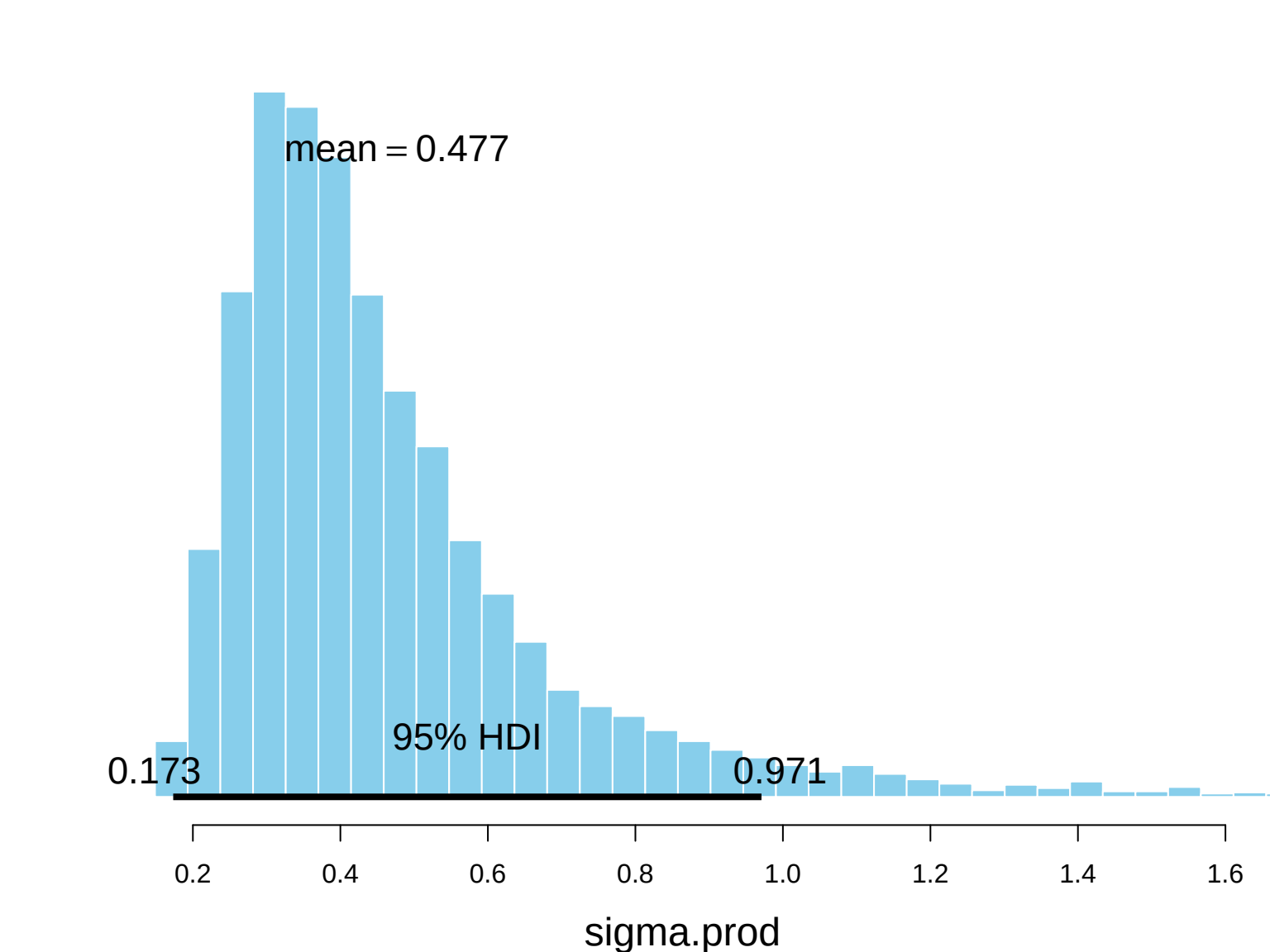

Salcha
BASE
salcha.discharge
ice.tanana
temp.incub
temp.juvi
ice.yukon
wind.stress.spring
wind.mixing.june
se.bs.may.sst
arctic.dipole.winter
slp.spring
ice.retreat
winter.prib.temp
m2.fav.wind
slp.winter
npgo
wind.stress.winter
arctic.oscillation
el.nino
alaskan.index
jpn.hat.chum
pink.total
Covariate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

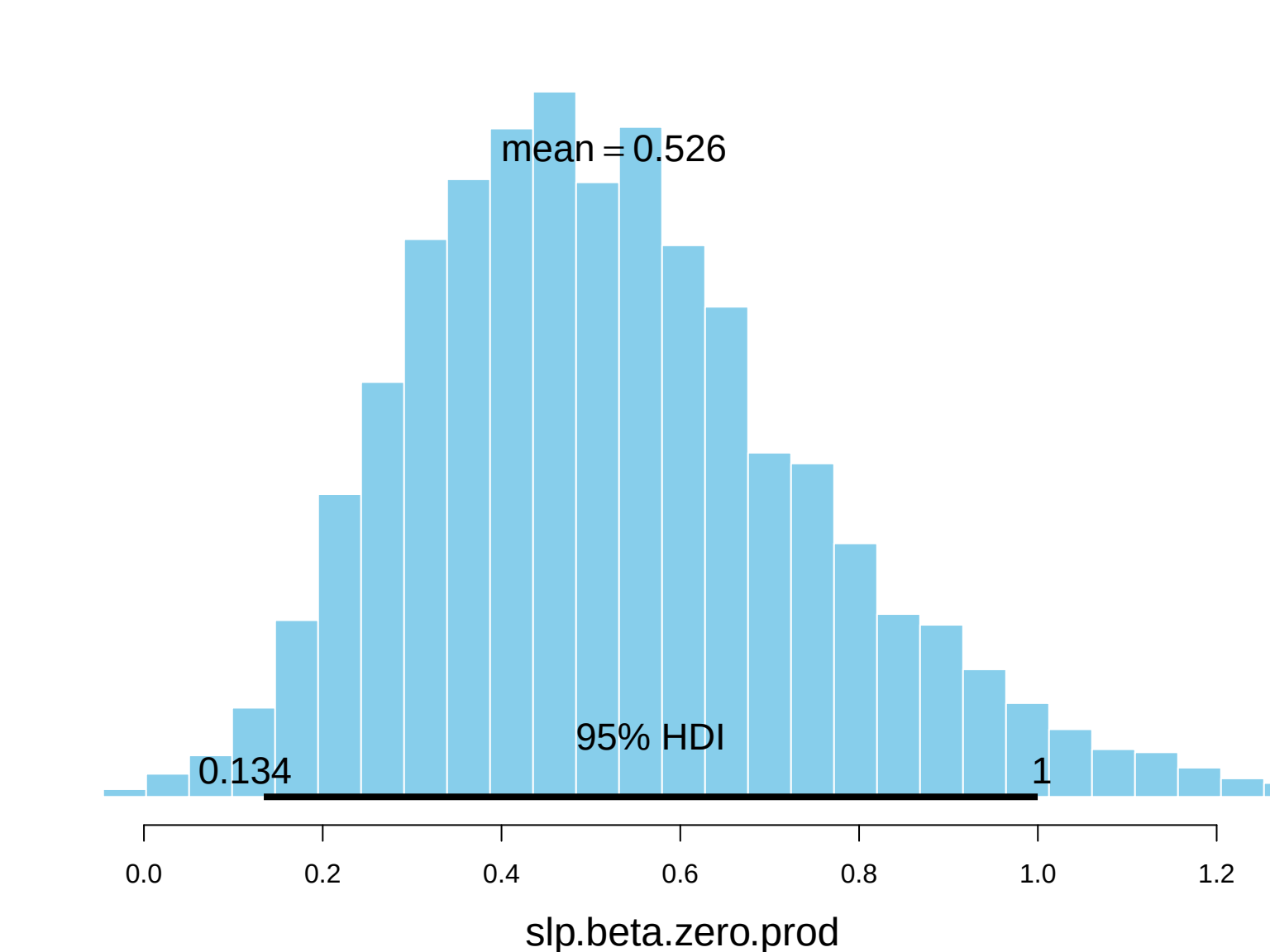

Salcha
BASE
salcha.discharge
ice.tanana
temp.incub
temp.juvi
ice.yukon
wind.stress.spring
wind.mixing.june
se.bs.may.sst
arctic.dipole.winter
slp.spring
ice.retreat
winter.prib.temp
m2.fav.wind
slp.winter
npgo
wind.stress.winter
arctic.oscillation
el.nino
alaskan.index
jpn.hat.chum
pink.total
Covariate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

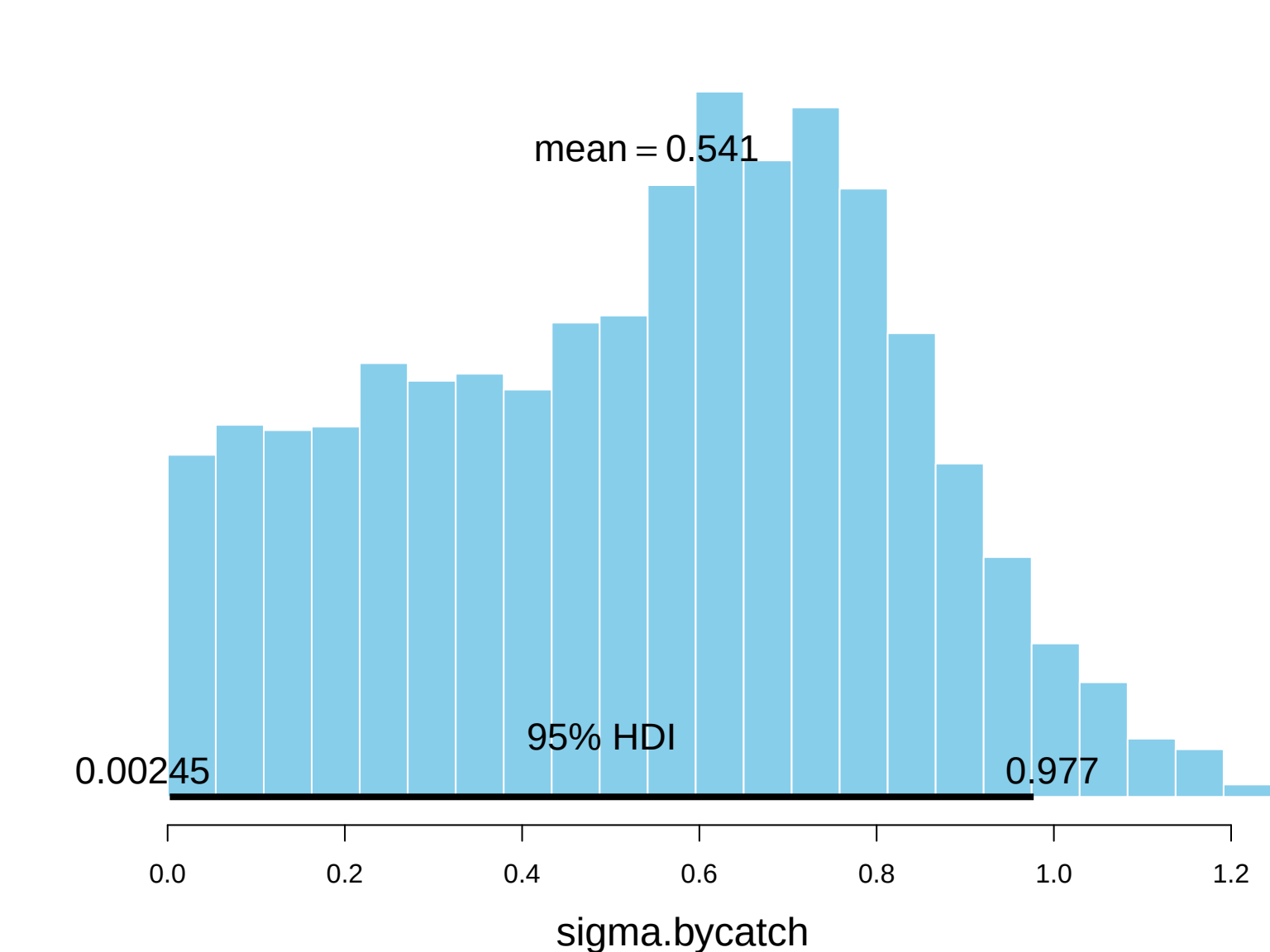

Salcha
BASE
salcha.discharge
ice.tanana
temp.incub
temp.juvi
ice.yukon
wind.stress.spring
wind.mixing.june
se.bs.may.sst
arctic.dipole.winter
slp.spring
ice.retreat
winter.prib.temp
m2.fav.wind
slp.winter
npgo
wind.stress.winter
arctic.oscillation
el.nino
alaskan.index
jpn.hat.chum
pink.total
Covariate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

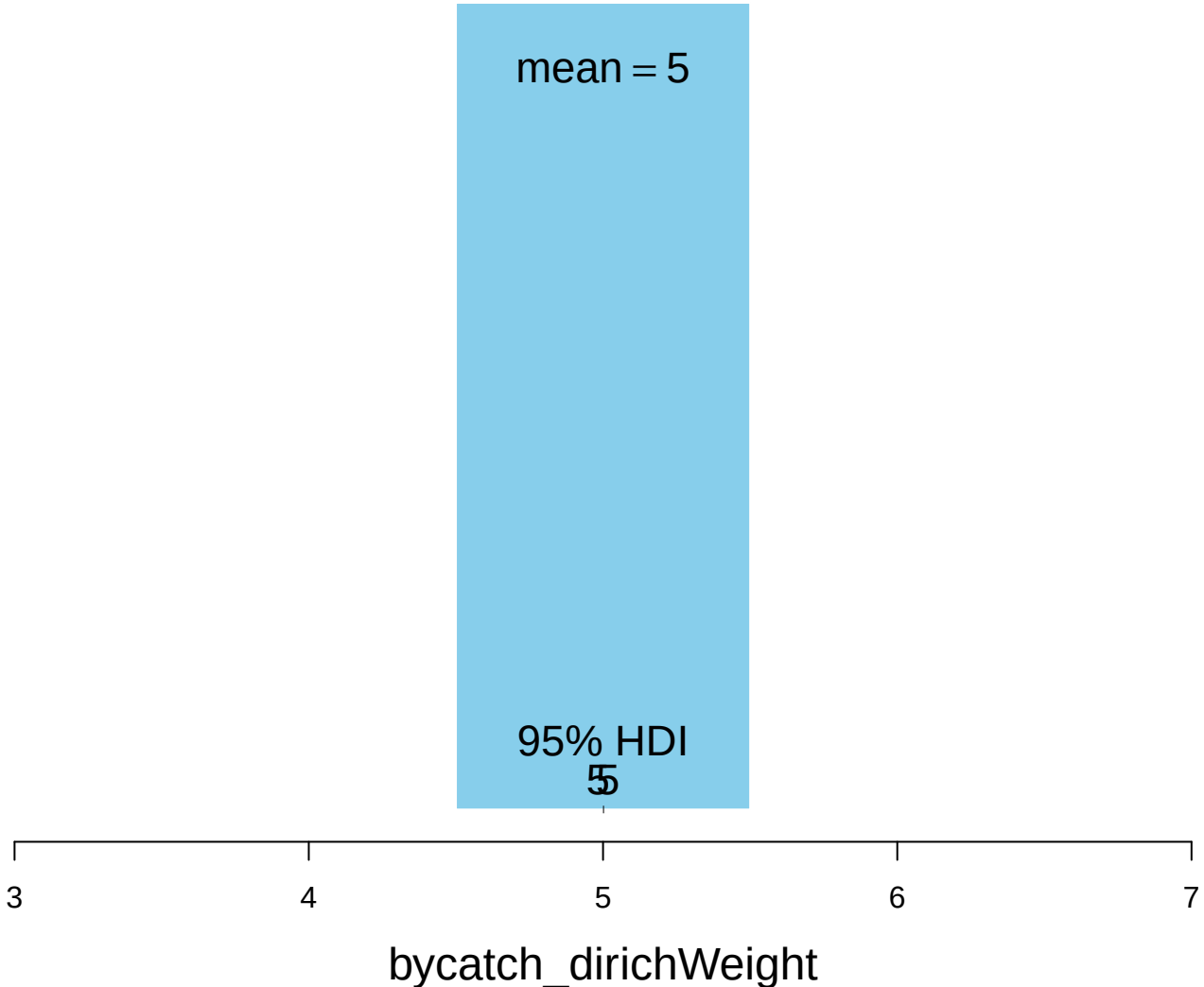

mean = 50
95% HDI
50
30
40
50
60
70
dirichWeight

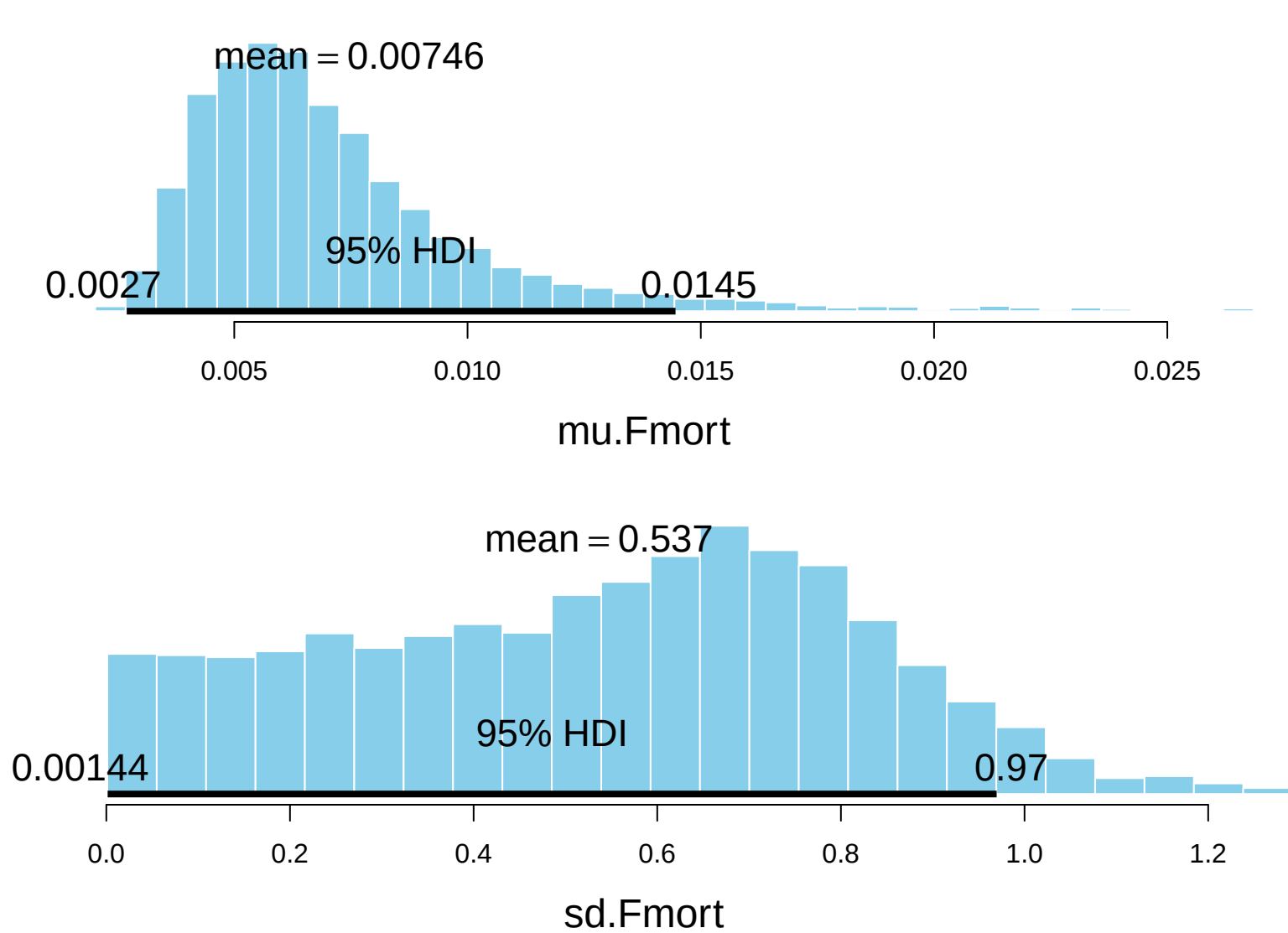

mean = 0.353
95% HDI
0.136
0.577
0.1
0.2
0.3
0.4
0.5
0.6
Prior Probability for Indicator Variables (pind)

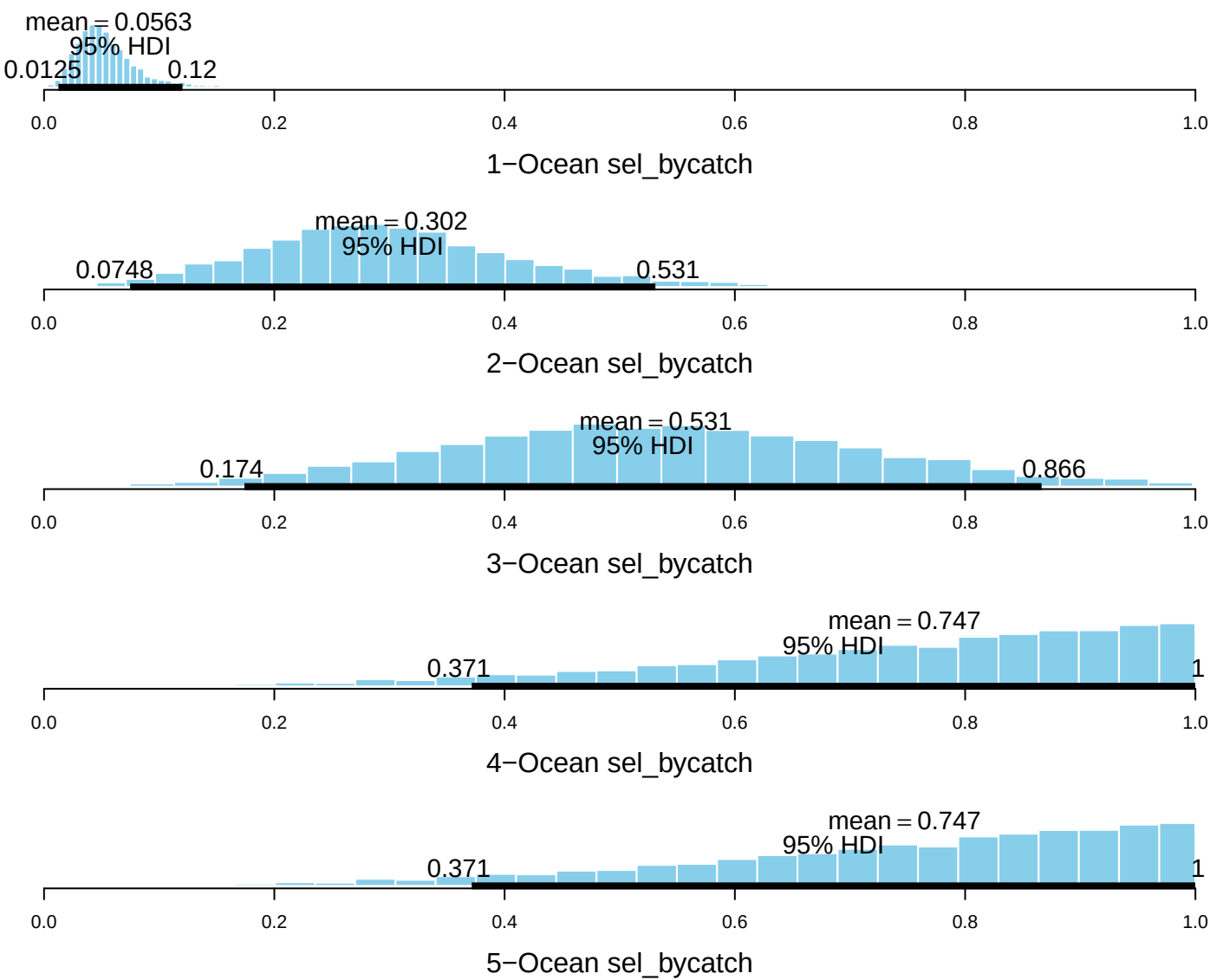

mean = 0.477
95% HDI
0.173
0.971
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
sigma.prod

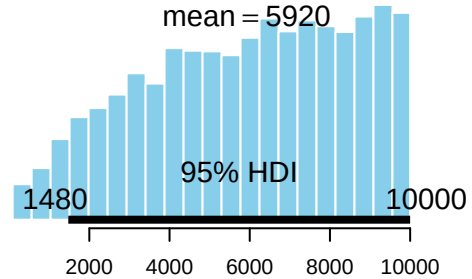

mean = 0.526
95% HDI
0.134
1
0.0
0.2
0.4
0.6
0.8
1.0
1.2
slp.beta.zero.prod


mean = 0.541
95% HDI
0.00245
0.977
0.0
0.2
0.4
0.6
0.8
1.0
1.2
sigma.bycatch

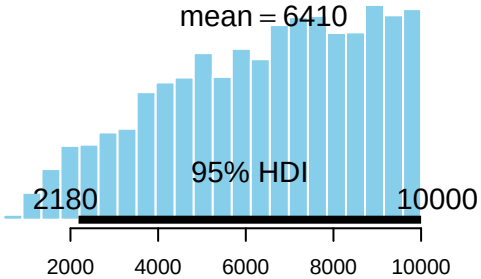

mean = 5
95% HDI
5
5
3
4
5
6
7
bycatch_dirichWeight


mean = 0.00746
95% HDI
0.0027
0.0145
0.005
0.010
0.015
0.020
0.025
mu.Fmort
mean = 0.537
95% HDI
0.00144
0.97
0.0
0.2
0.4
0.6
0.8
1.0
1.2
sd.Fmort

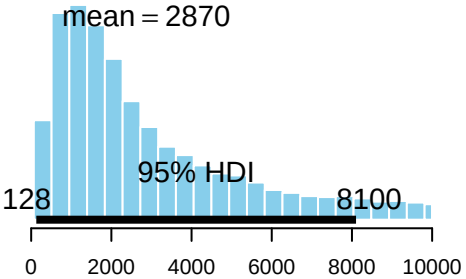

mean = 0.0563
95% HDI
0.0125
0.12
0.0
0.2
0.4
0.6
0.8
1.0
1−Ocean sel_bycatch
mean = 0.302
95% HDI
0.0748
0.531
2−Ocean sel_bycatch
mean = 0.531
95% HDI
0.174
0.866
3−Ocean sel_bycatch
mean = 0.747
95% HDI
0.371
1
4−Ocean sel_bycatch
mean = 0.747
95% HDI
0.371
1
5−Ocean sel_bycatch



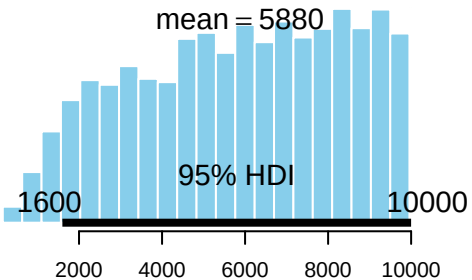
Init Year: 1980



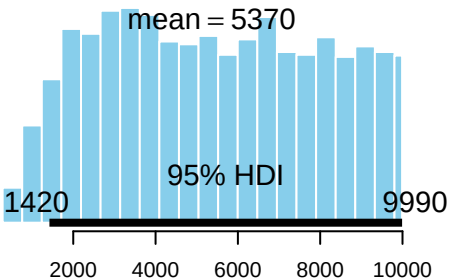
Init Year: 1981



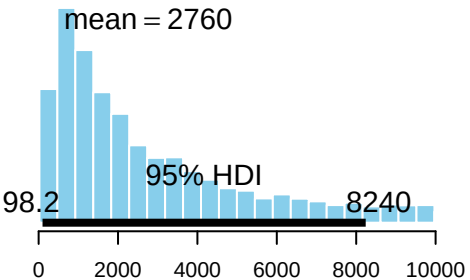
Init Year: 1982



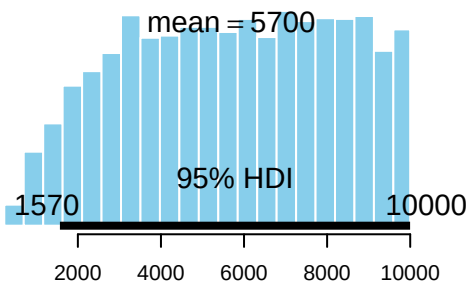
Init Year: 1983



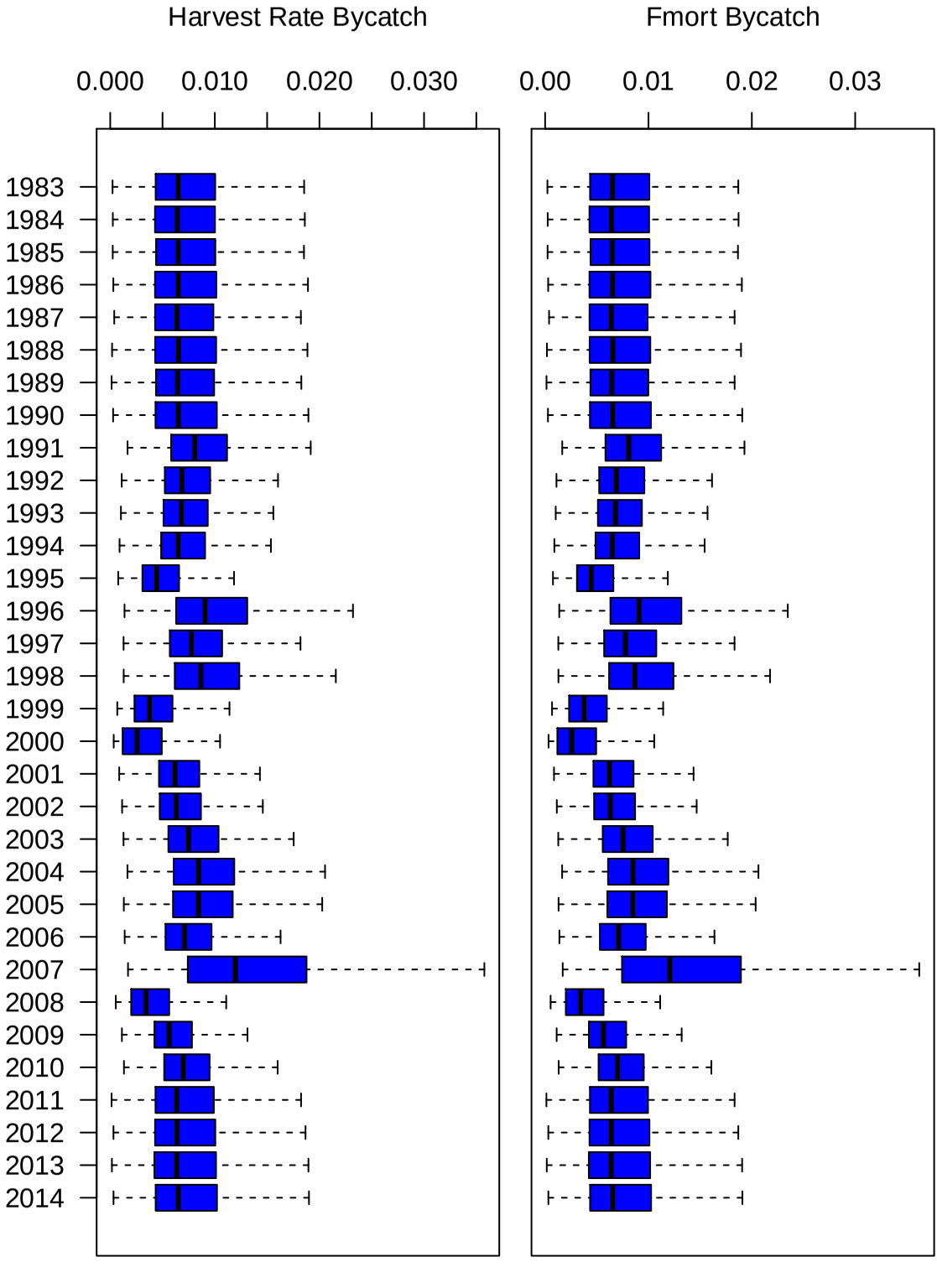
Init Year: 1984

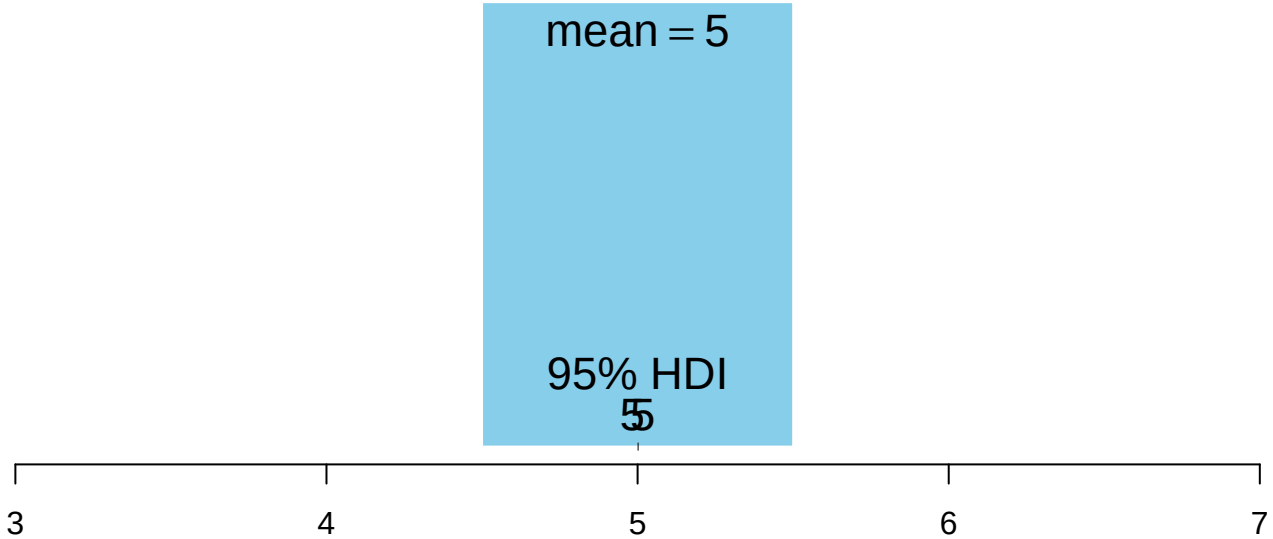


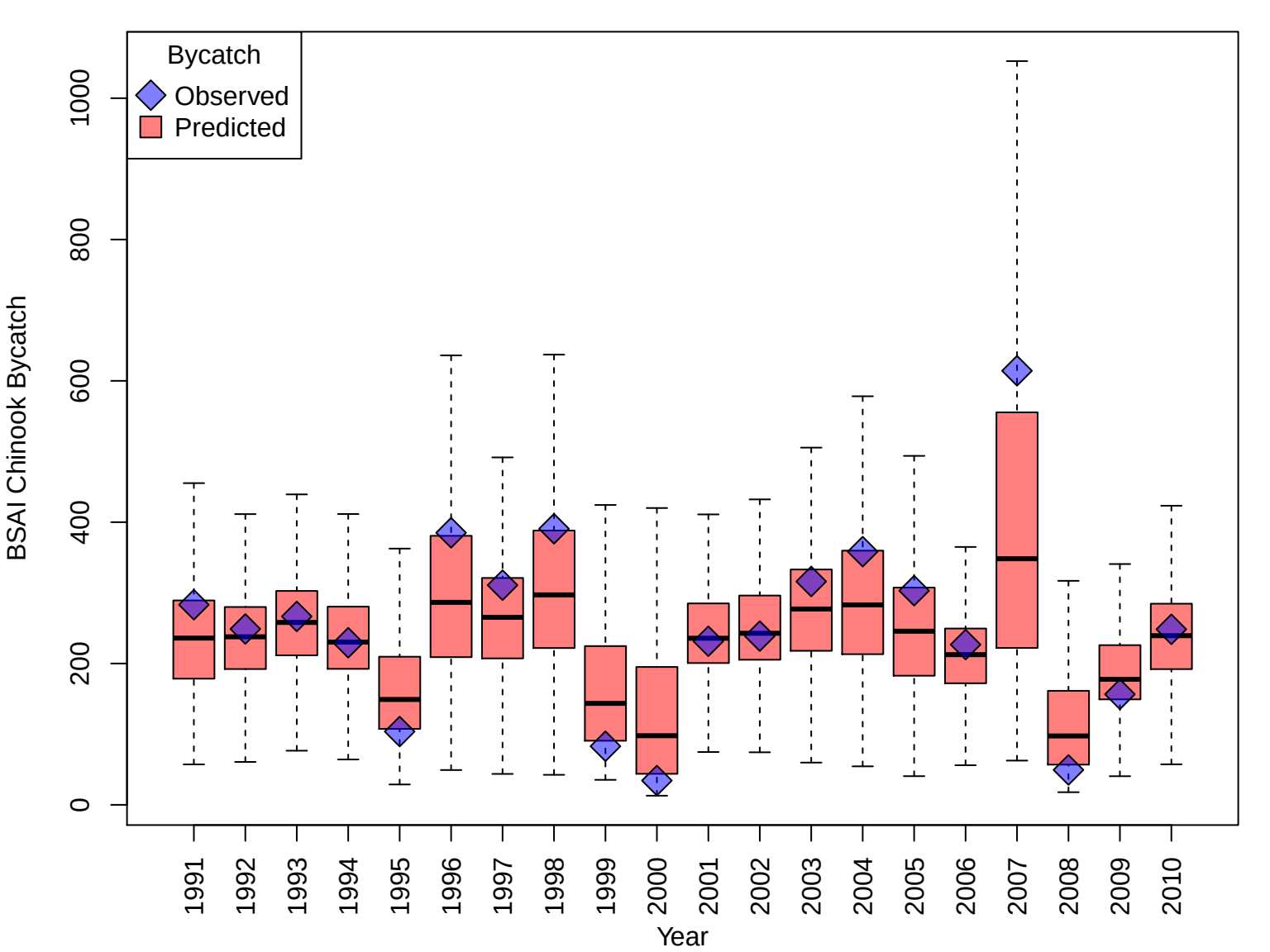
Init Year: 1985

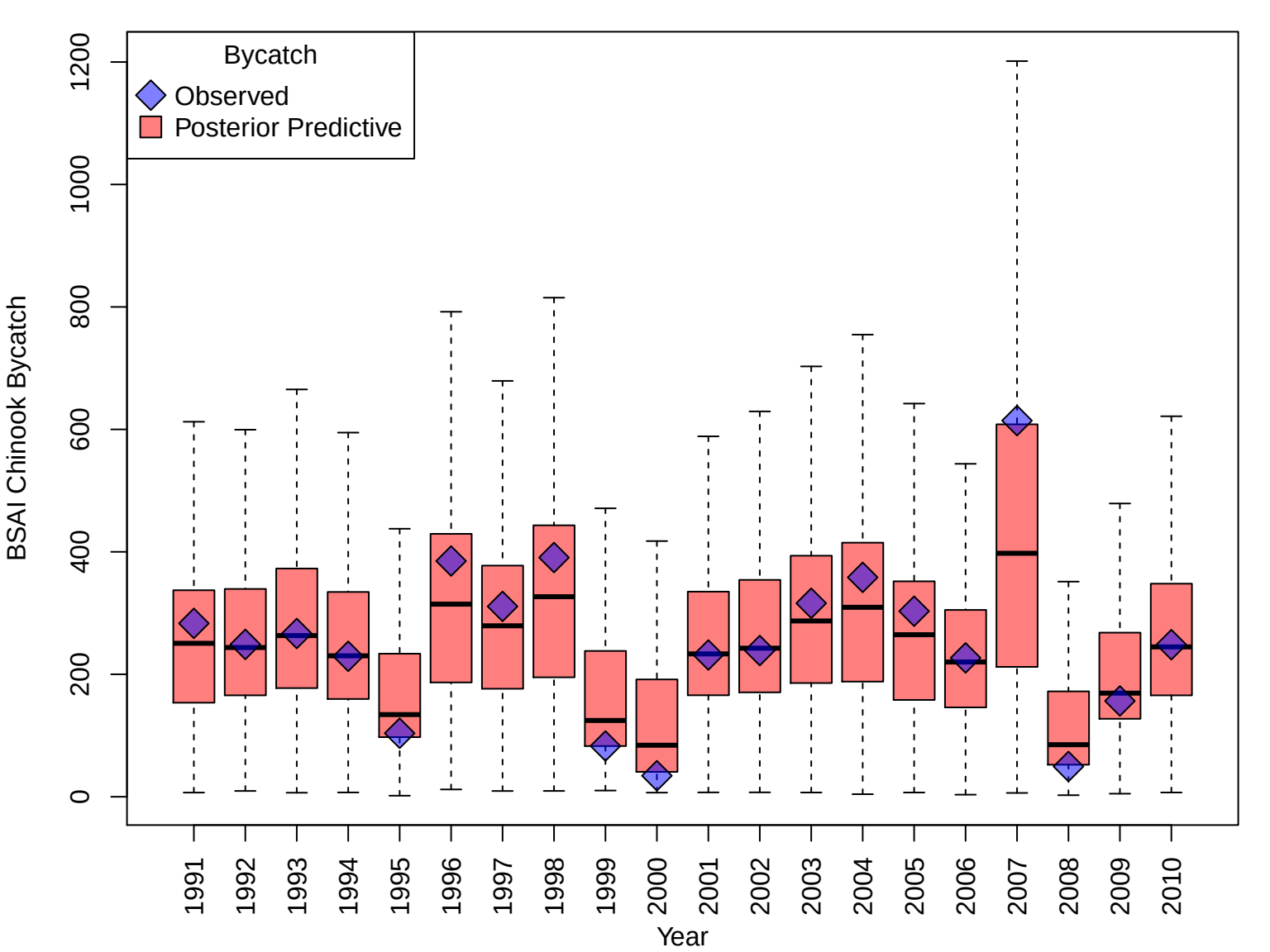


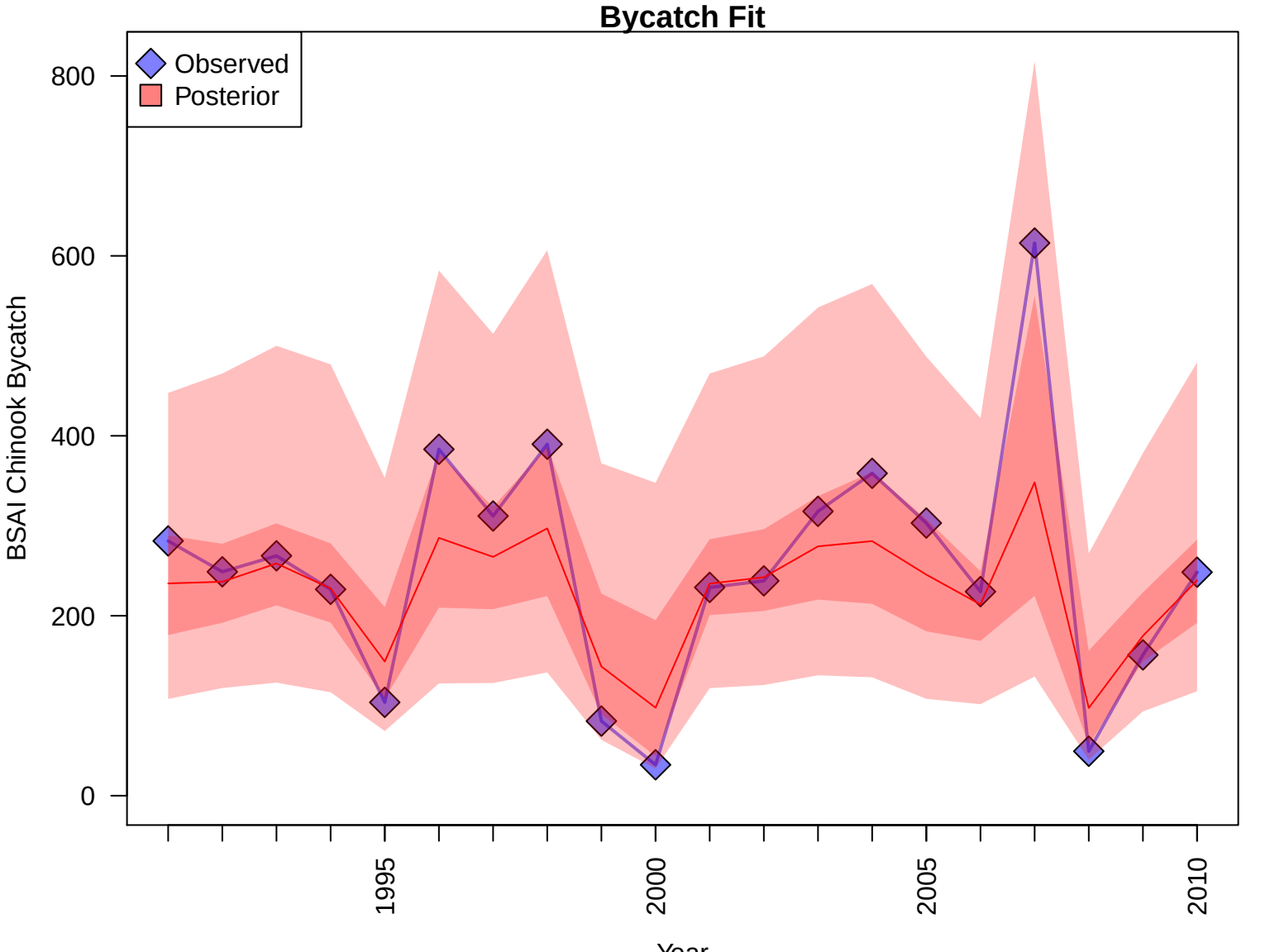
Init Year: 1986

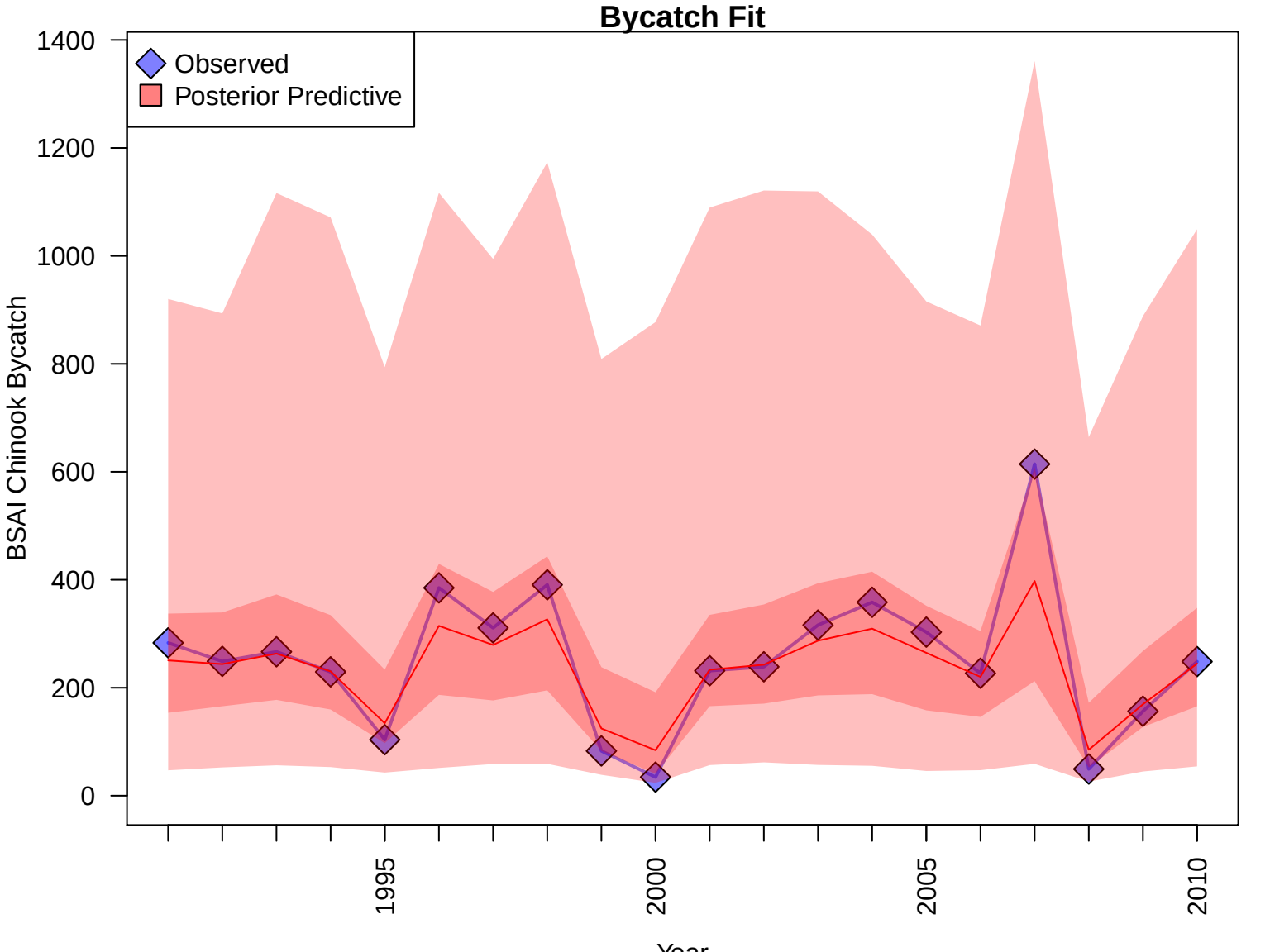

Harvest Rate Bycatch
0.000
0.010
0.020
0.030
Fmort Bycatch
0.00
0.01
0.02
0.03
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014

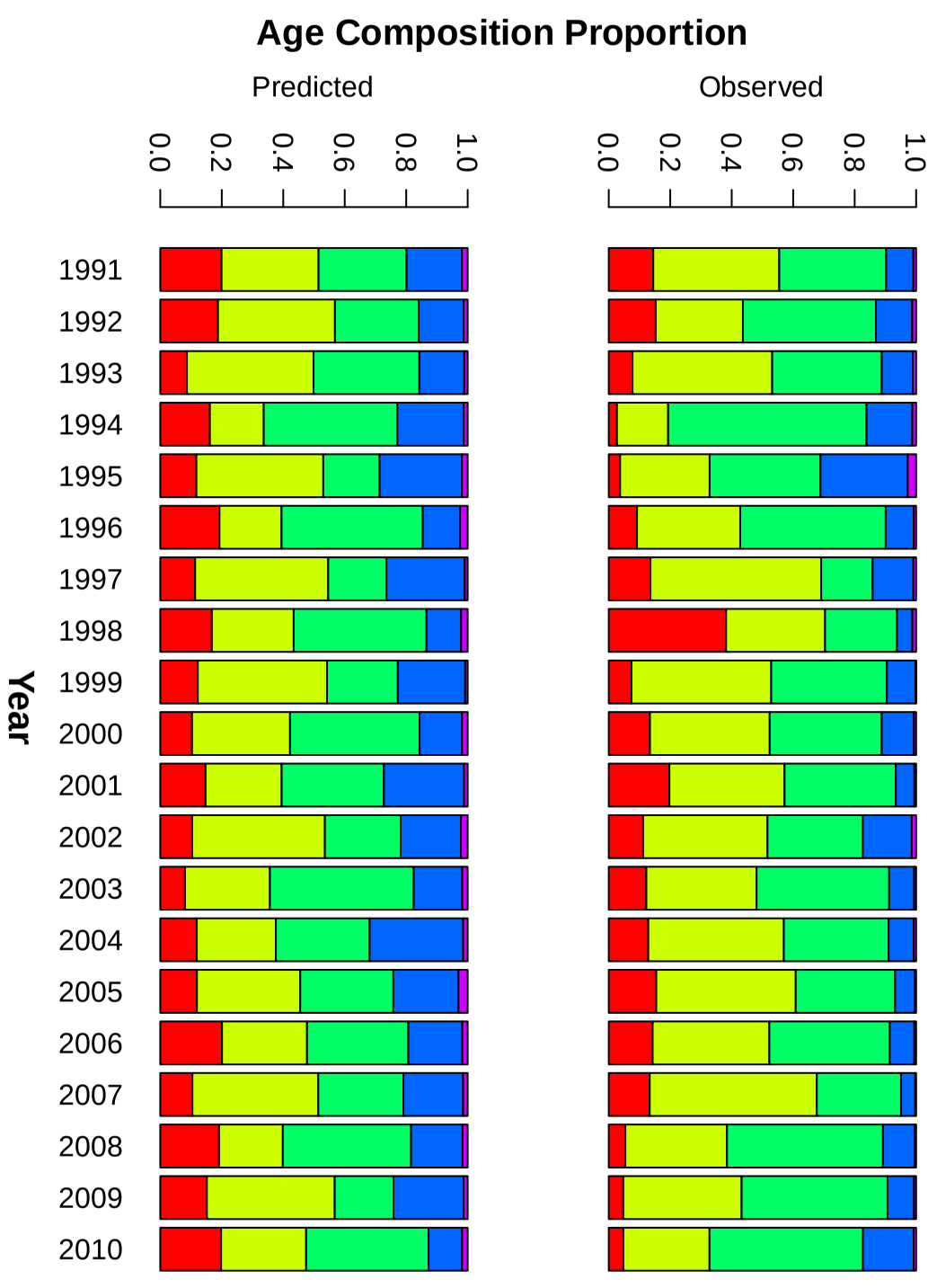

mean = 5
95% HDI
5
3
4
5
6
7

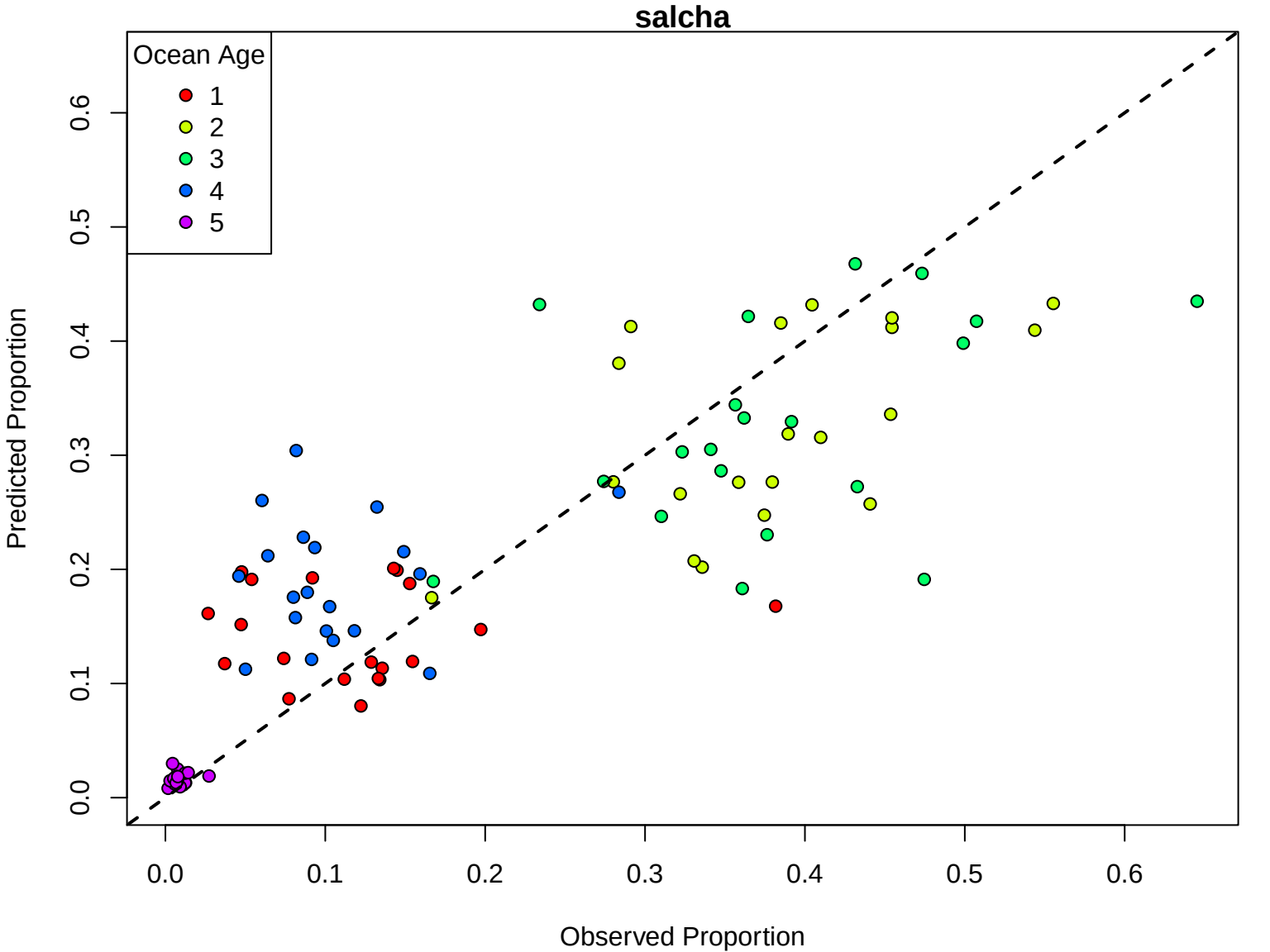

Bycatch
Observed
Predicted
BSAI Chinook Bycatch
0
200
400
600
800
1000
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Year

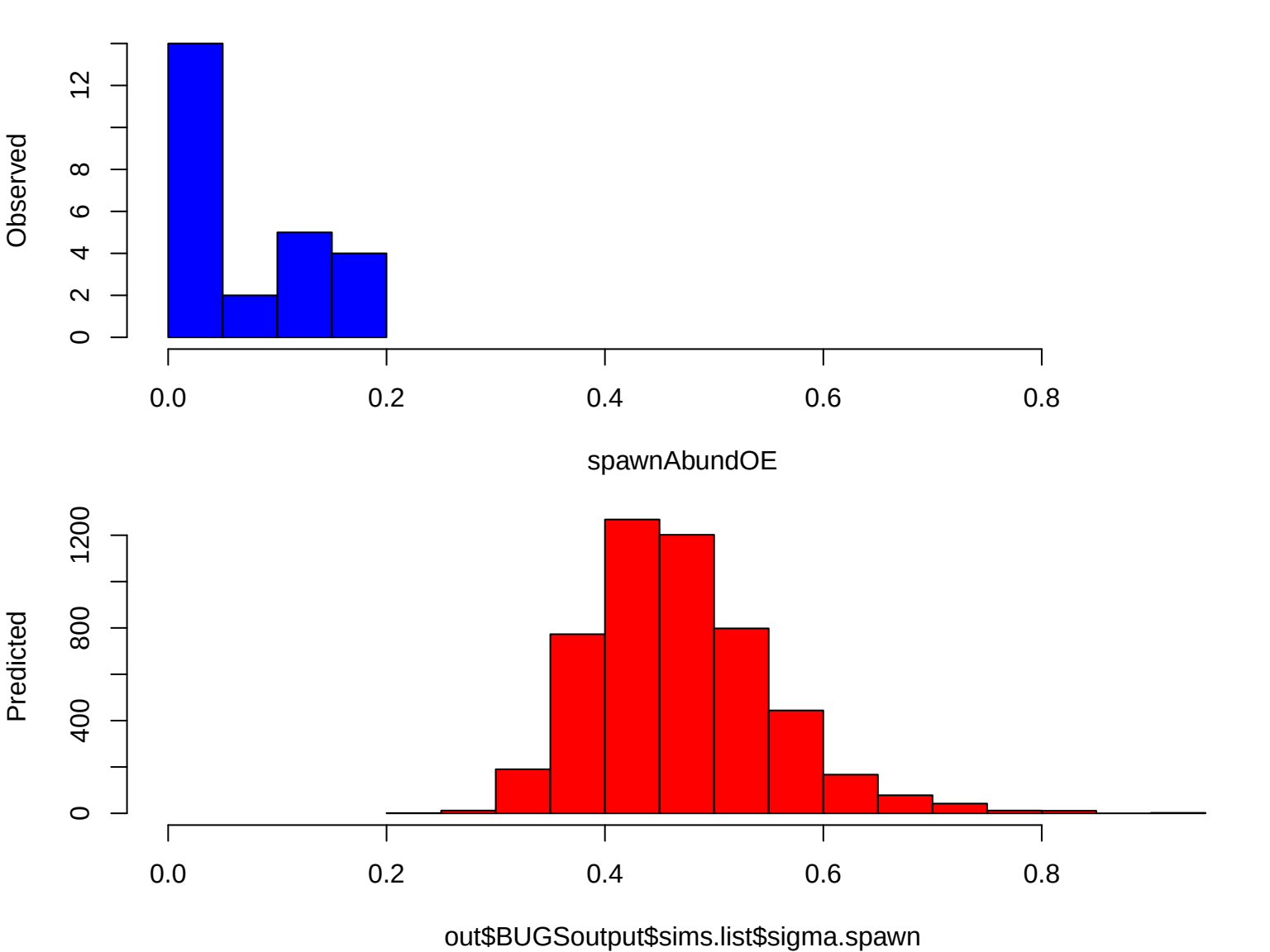

Bycatch
Observed
Posterior Predictive
BSAI Chinook Bycatch
0
200
400
600
800
1000
1200
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Year


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


Bycatch Fit
Observed
Posterior Predictive
BSAI Chinook Bycatch
1400
1200
1000
800
600
400
200
0
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


salcha
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
400
800
1200
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
salcha.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