Comisión Interamericana del Atún Tropical
Inter-American Tropical Tuna Commission

CIAT
IATTC

Development of a new benchmark model for yellowfin tuna in the EPO

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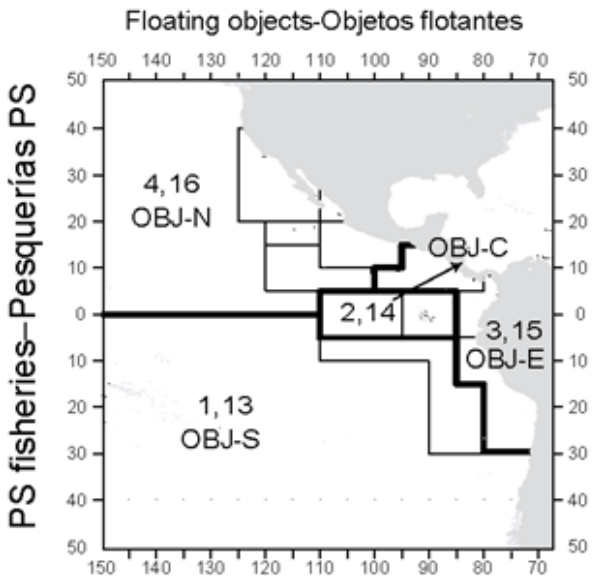
2nd Stock assessment Review Workshop, La Jolla, California USA, 2-6 December 2019

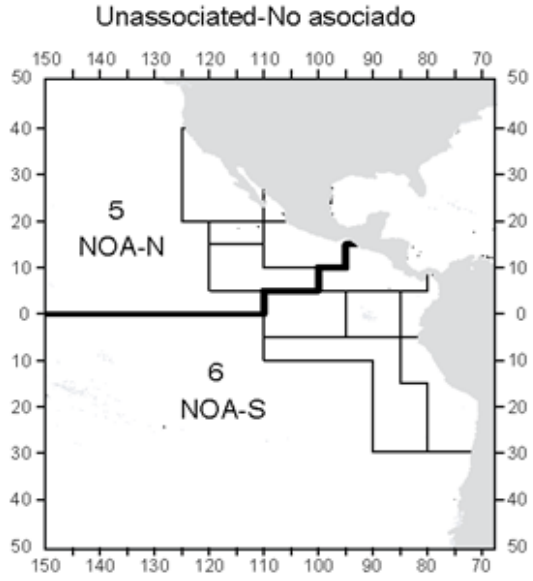
Fisheries definitions of “former” model (SAC 10)

Purse-seine

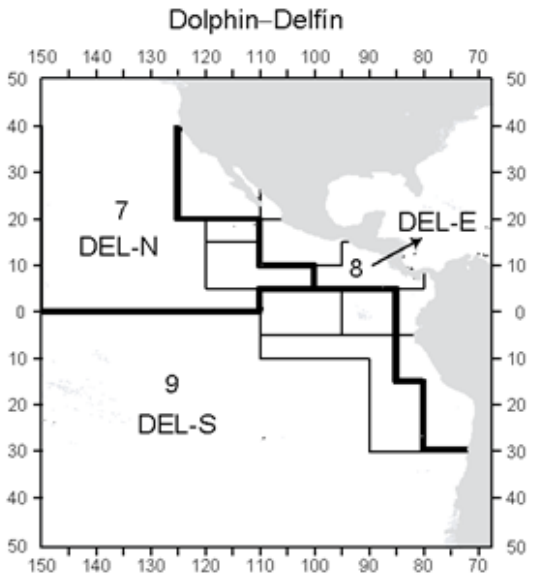
Floating objects



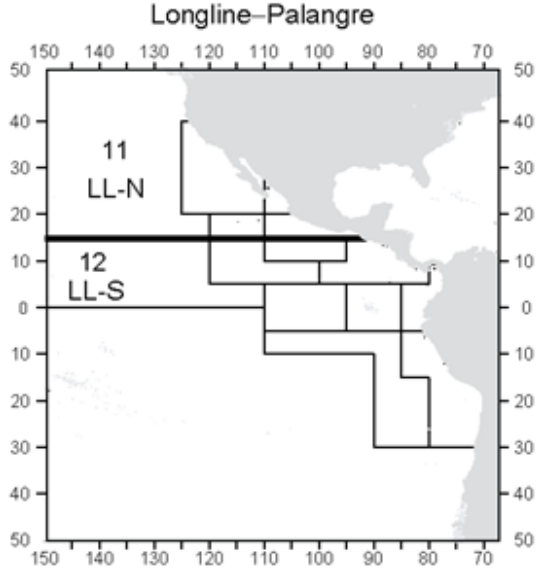
Free schools



Dolphins



Longline



IATTC length-frequency sampling areas

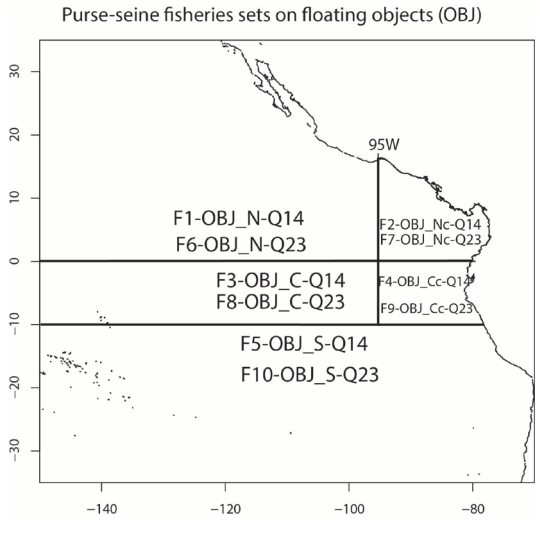
fishery definition areas

Bait-boat: one fishery for the whole EPO

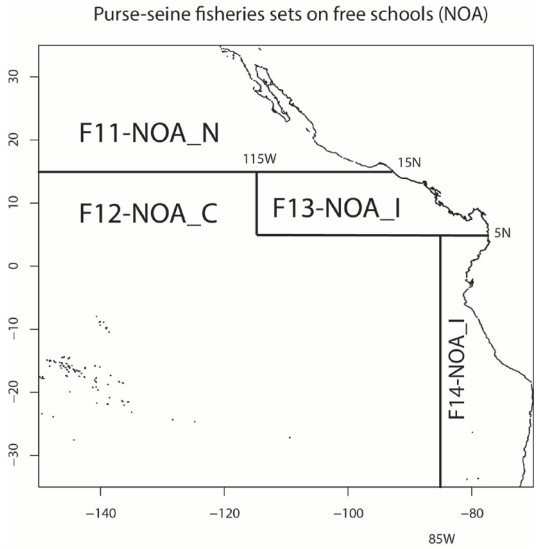
Fisheries definition of new model

Purse-seine

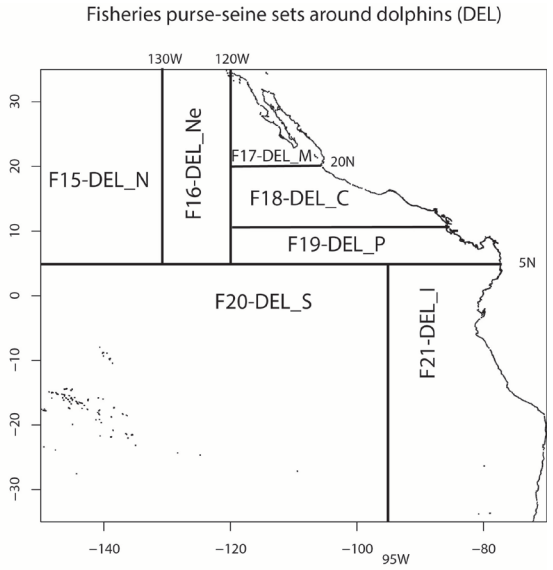
Floating objects



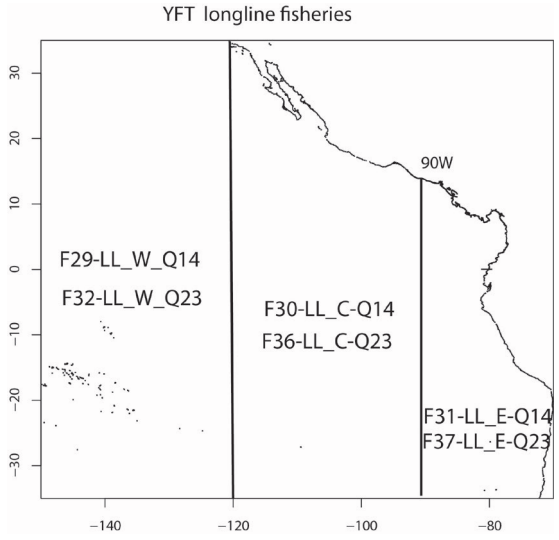
Free schools



Dolphins



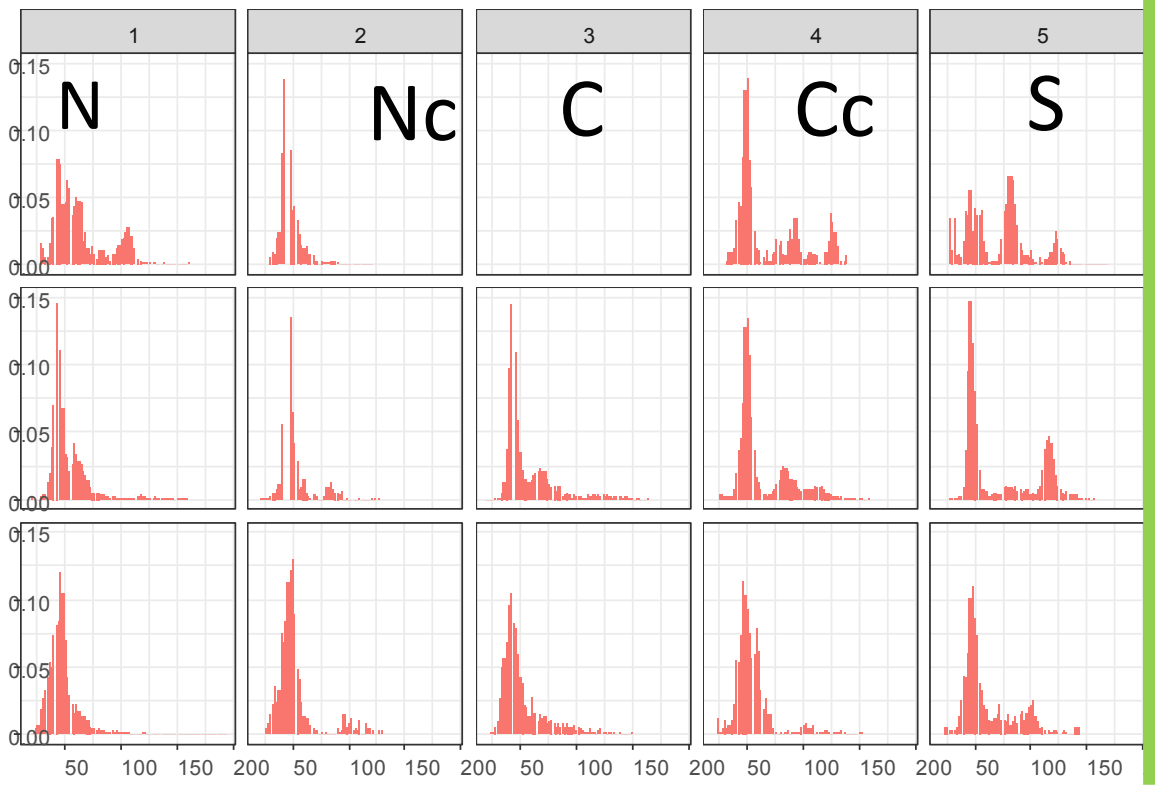
Longline



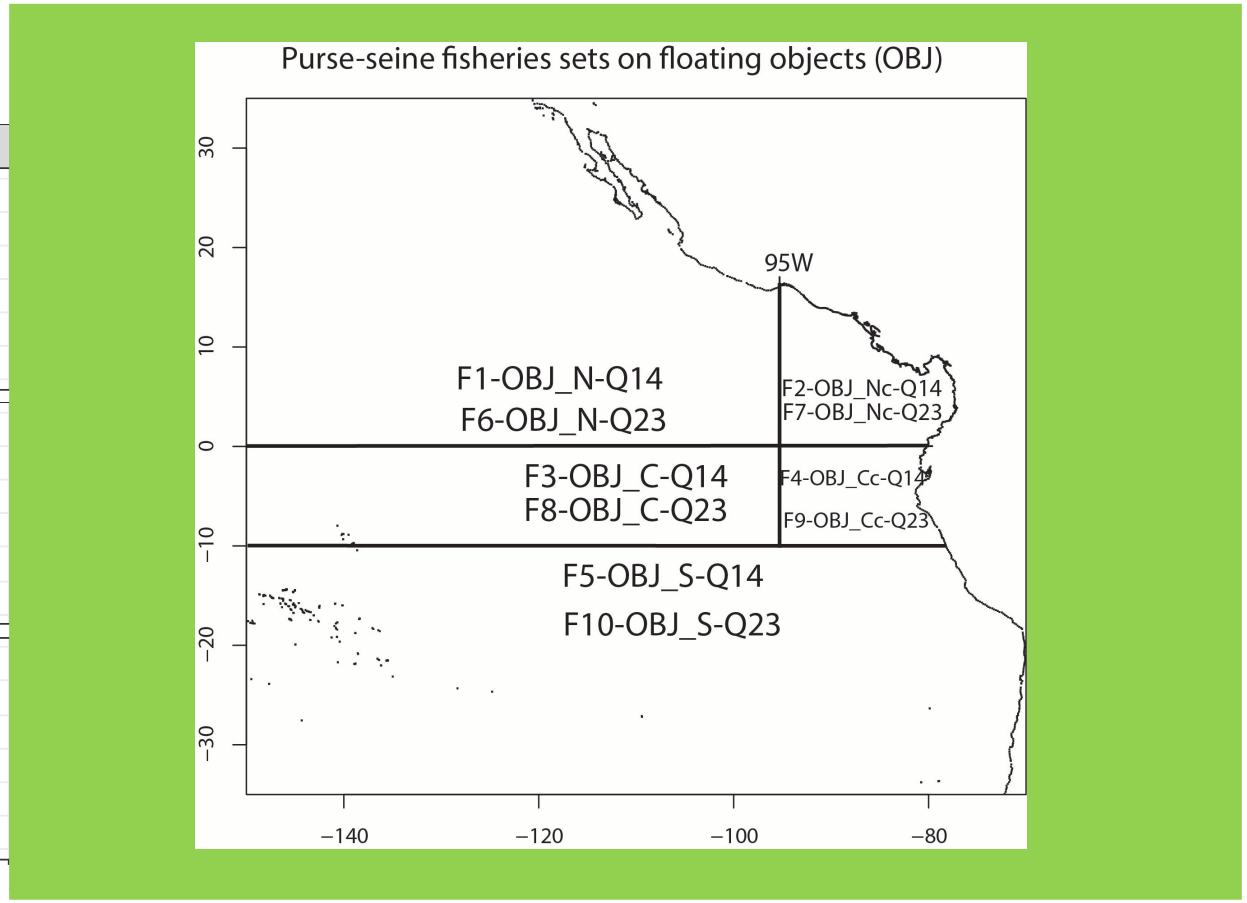
Bait-boat: one fishery for the whole EPO

Fisheries defined to have similar length frequencies, thus to facilitate the modelling of selectivity

Quarters 14



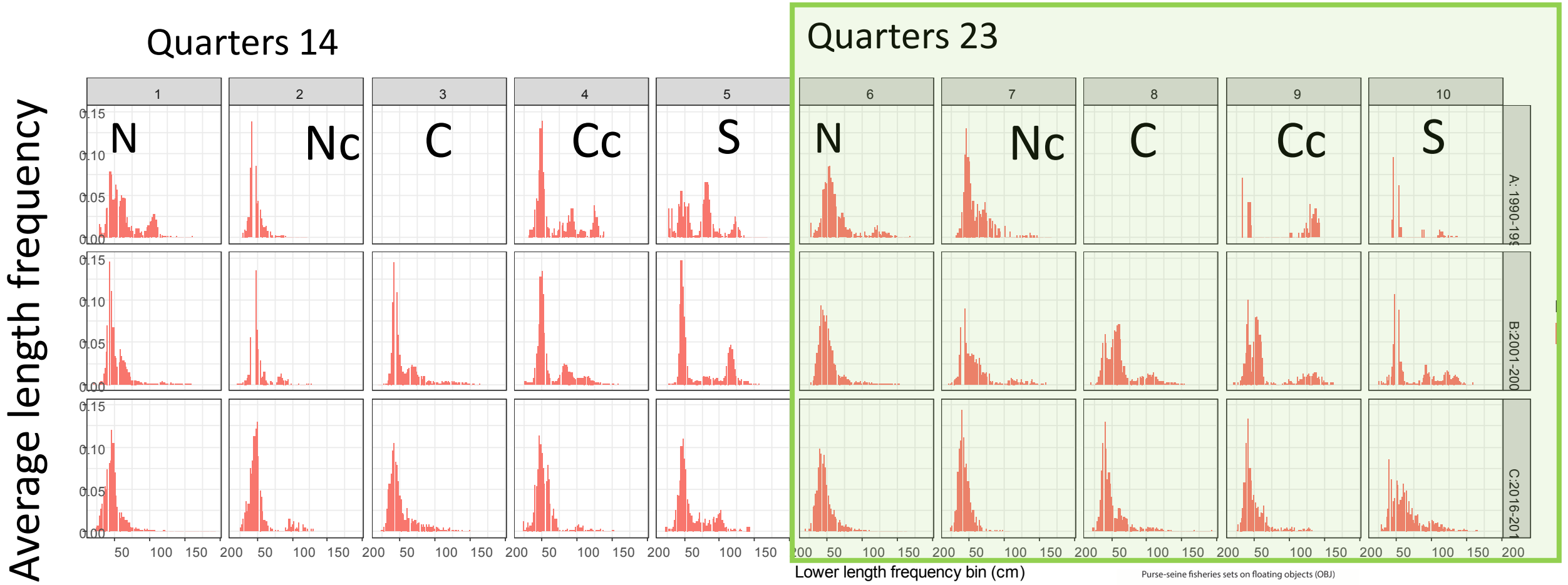
Average length frequency

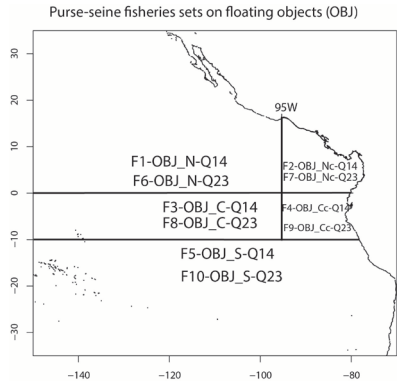


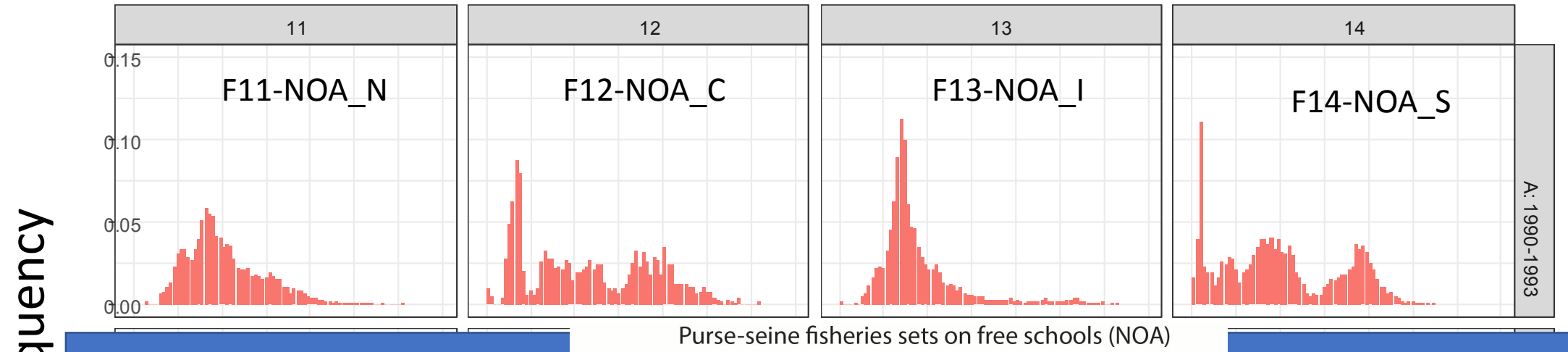
Lower length frequency bin (cm)

Quarters 14

Quarters 23

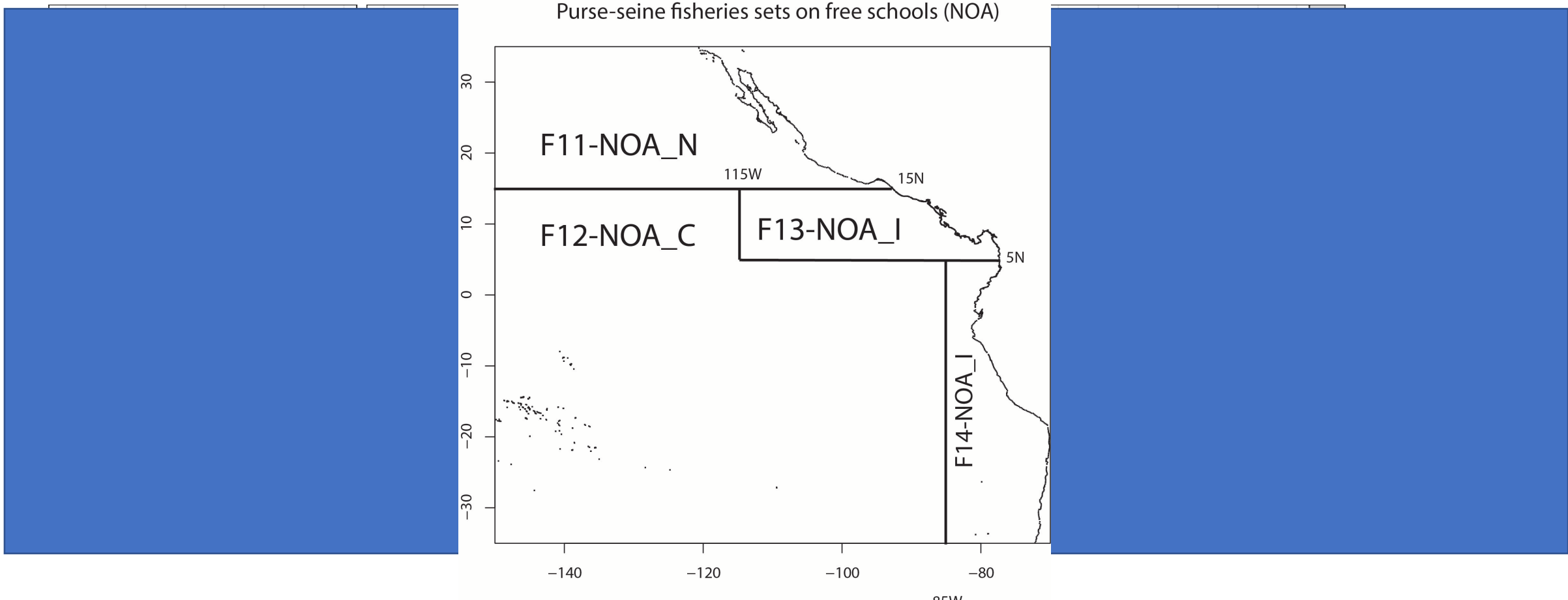


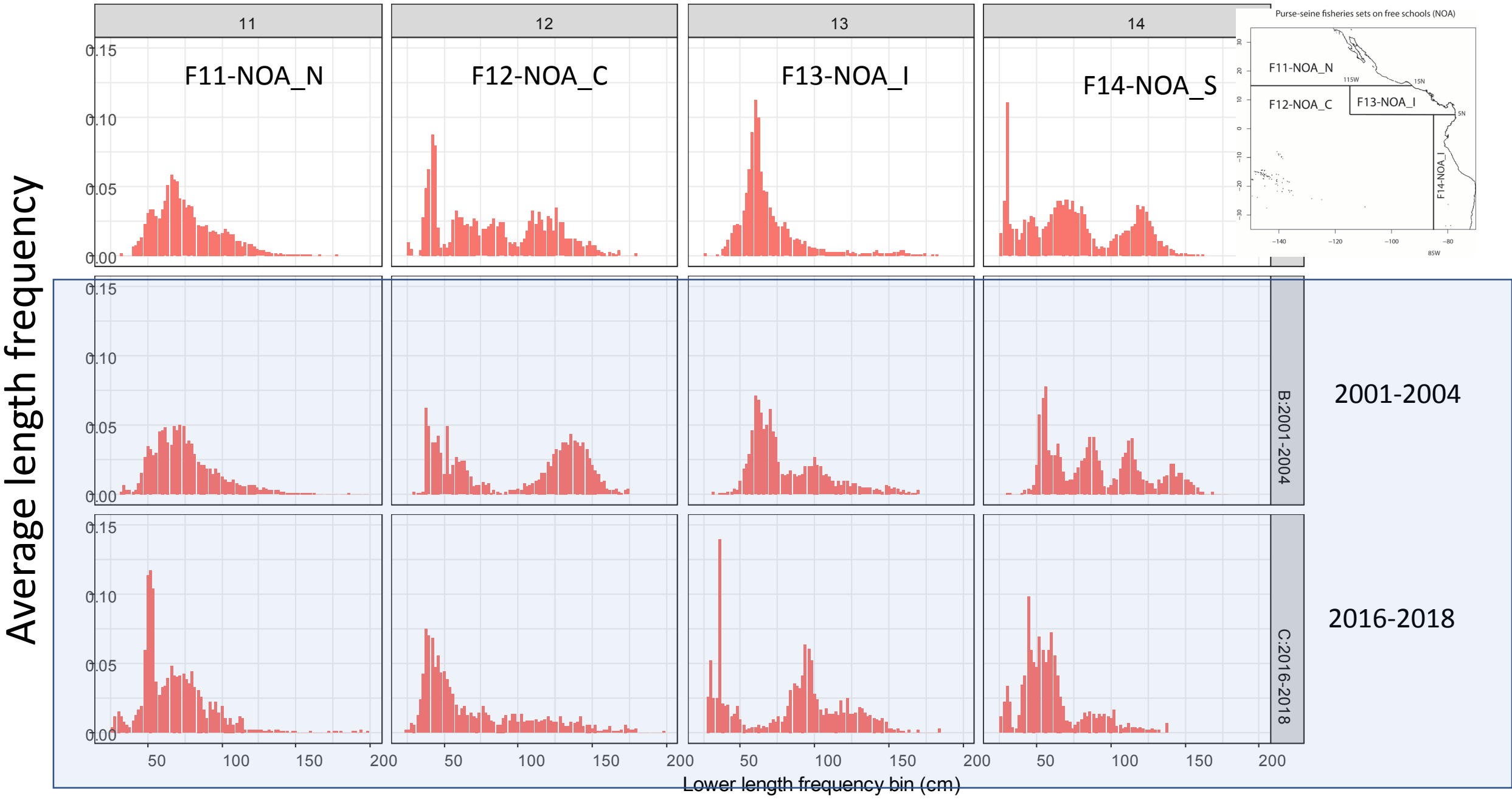




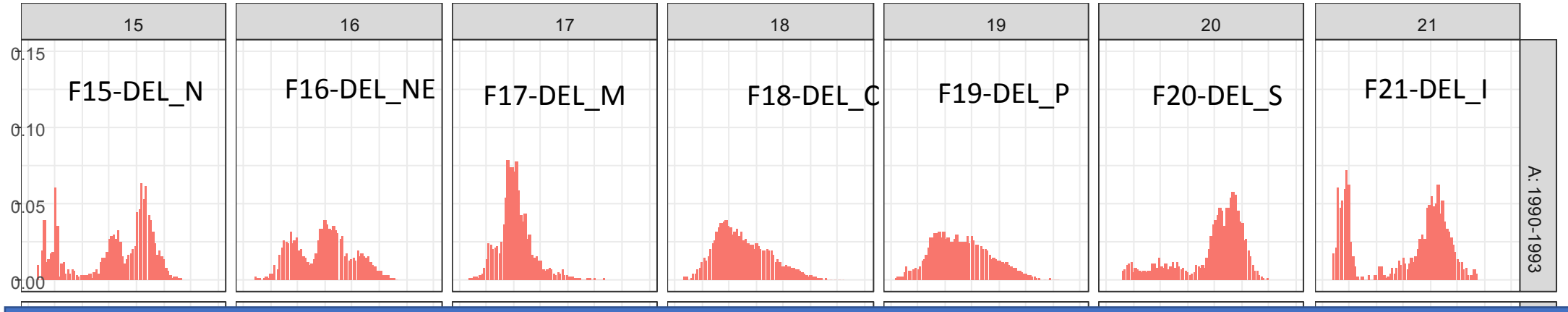
1990-1993

Average length frequency

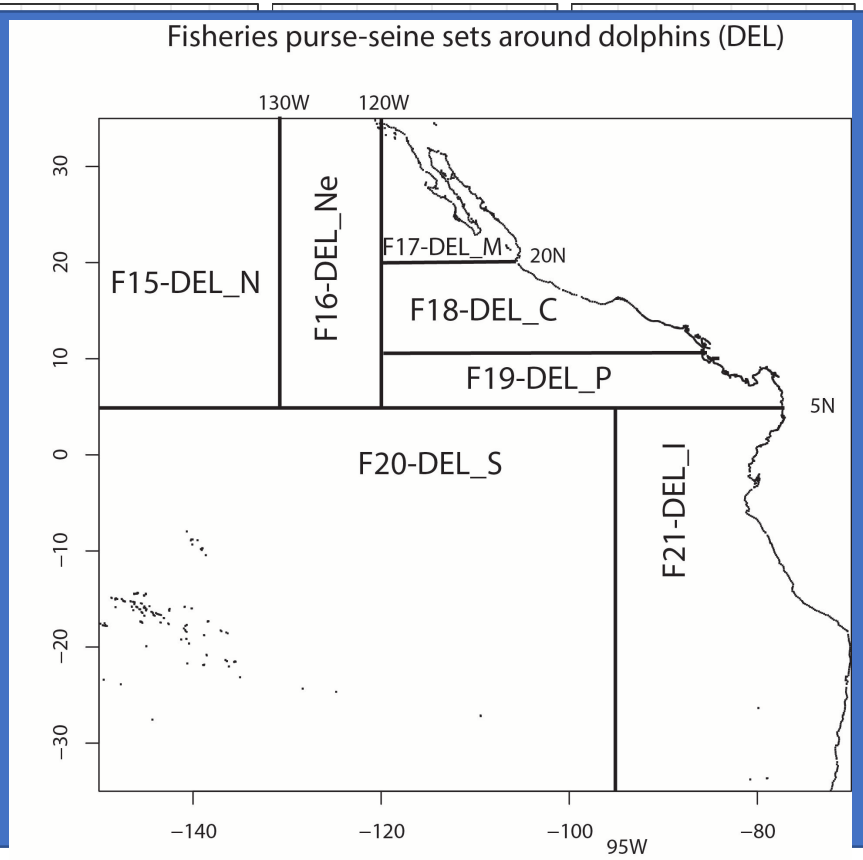


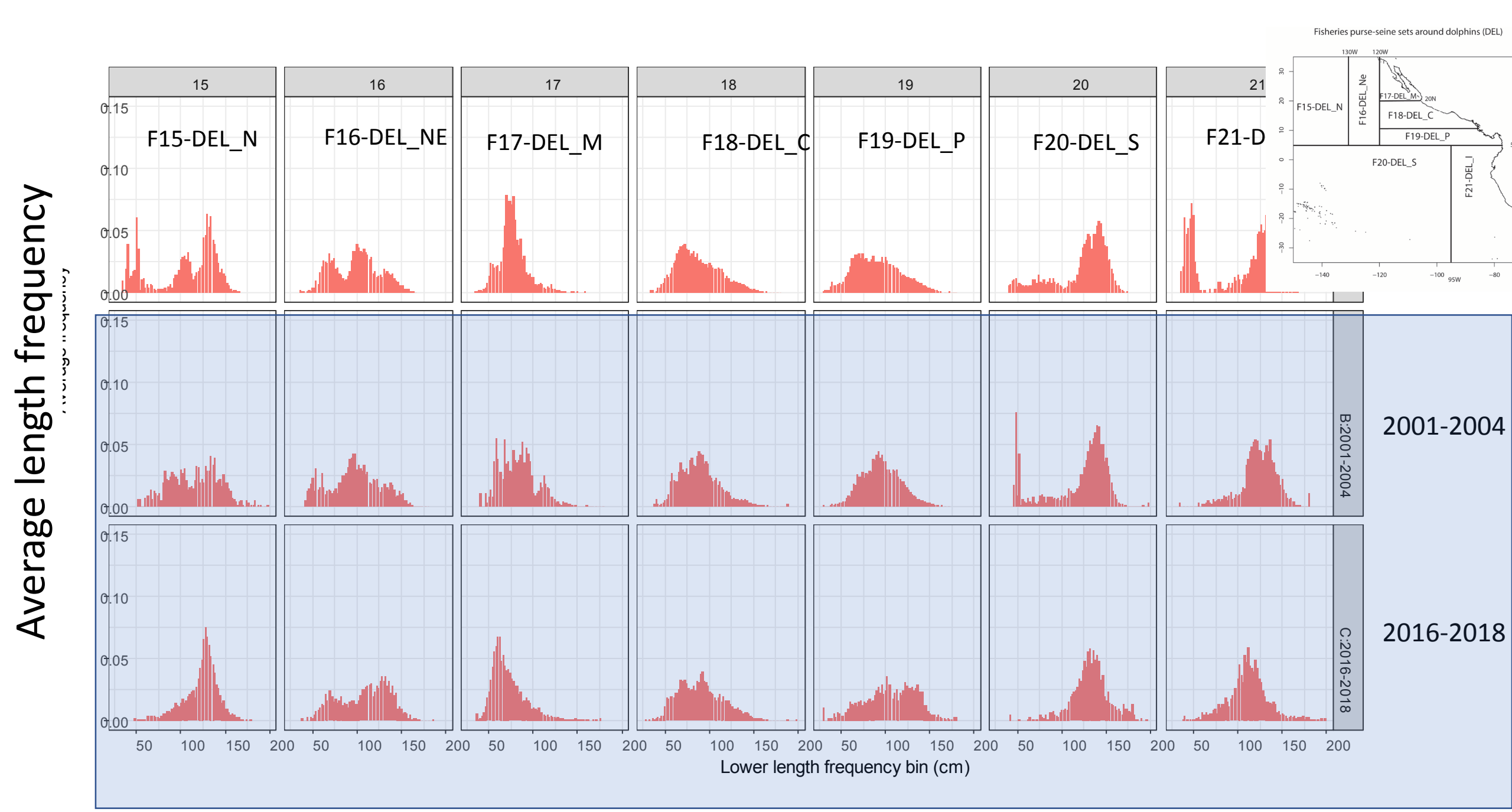

Average length frequency
11
12
13
14
F11-NOA_N
F12-NOA_C
F13-NOA_I
F14-NOA_S
Purse-seine fisheries sets on free schools (NOA)
F11-NOA_N
F12-NOA_C
F13-NOA_I
F14-NOA_I
115W
15N
5N
85W
B:2001-2004
C:2016-2018
2001-2004
2016-2018
0.15
0.10
0.05
0.00
50
100
150
200
Lower length frequency bin (cm)

Average length frequency

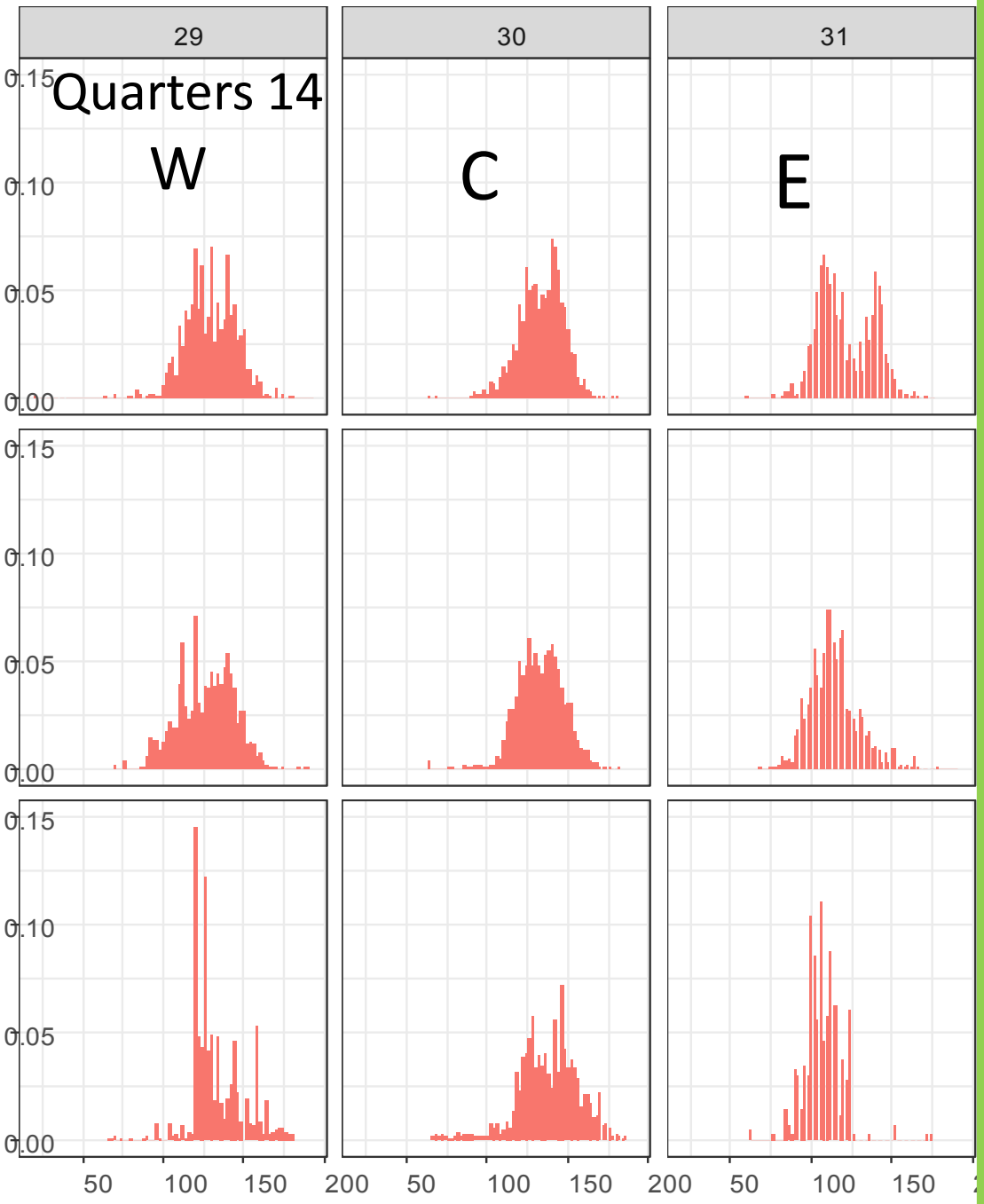


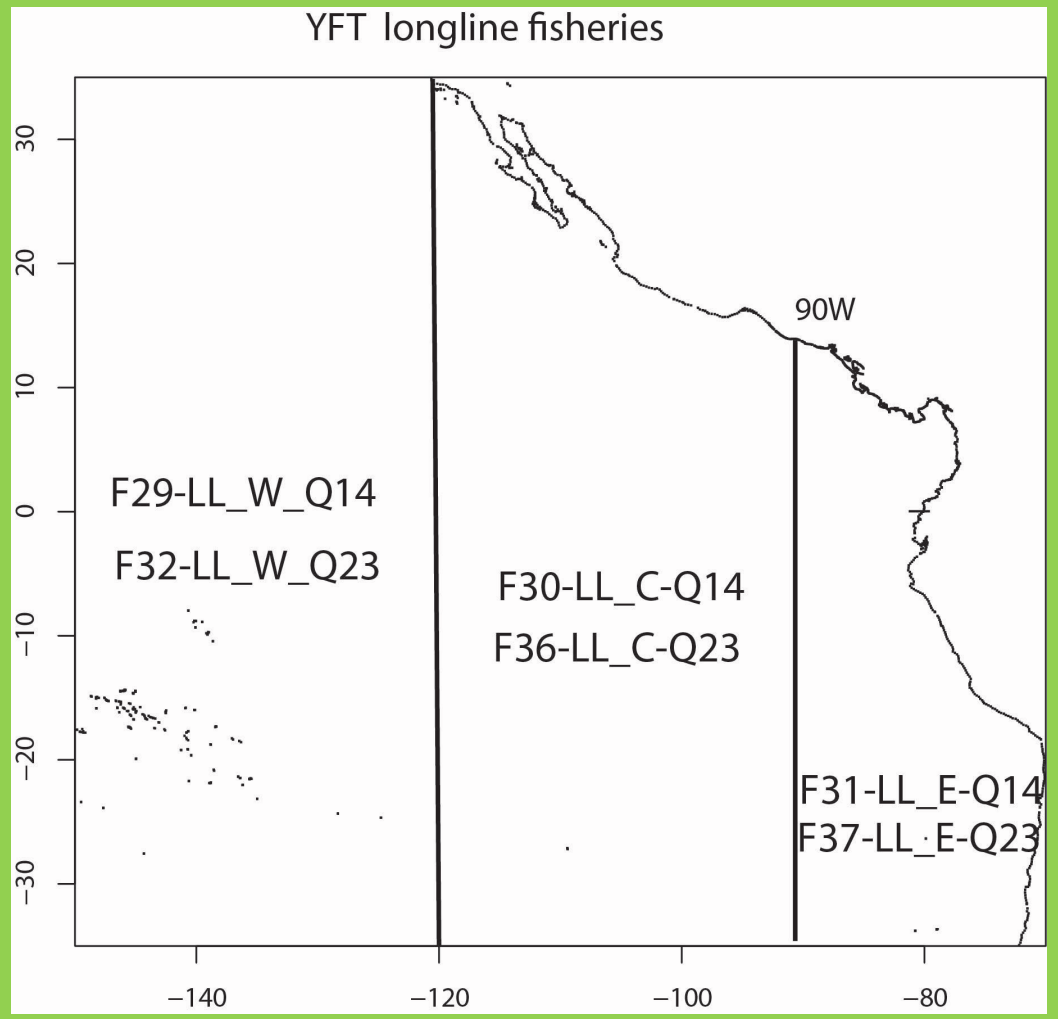
1990-1993




Average length frequency
15
16
17
18
19
20
21
F15-DEL_N
F16-DEL_NE
F17-DEL_M
F18-DEL_C
F19-DEL_P
F20-DEL_S
F21-D
0.15
0.10
0.05
0.00
B:2001-2004
C:2016-2018
2001-2004
2016-2018
50
100
150
200
Lower length frequency bin (cm)
Fisheries purse-seine sets around dolphins (DEL)
130W
120W
F15-DEL_N
F16-DEL_Ne
F17-DEL_M
20N
F18-DEL_C
F19-DEL_P
F20-DEL_S
F21-DEL_I
95W

Average length frequency

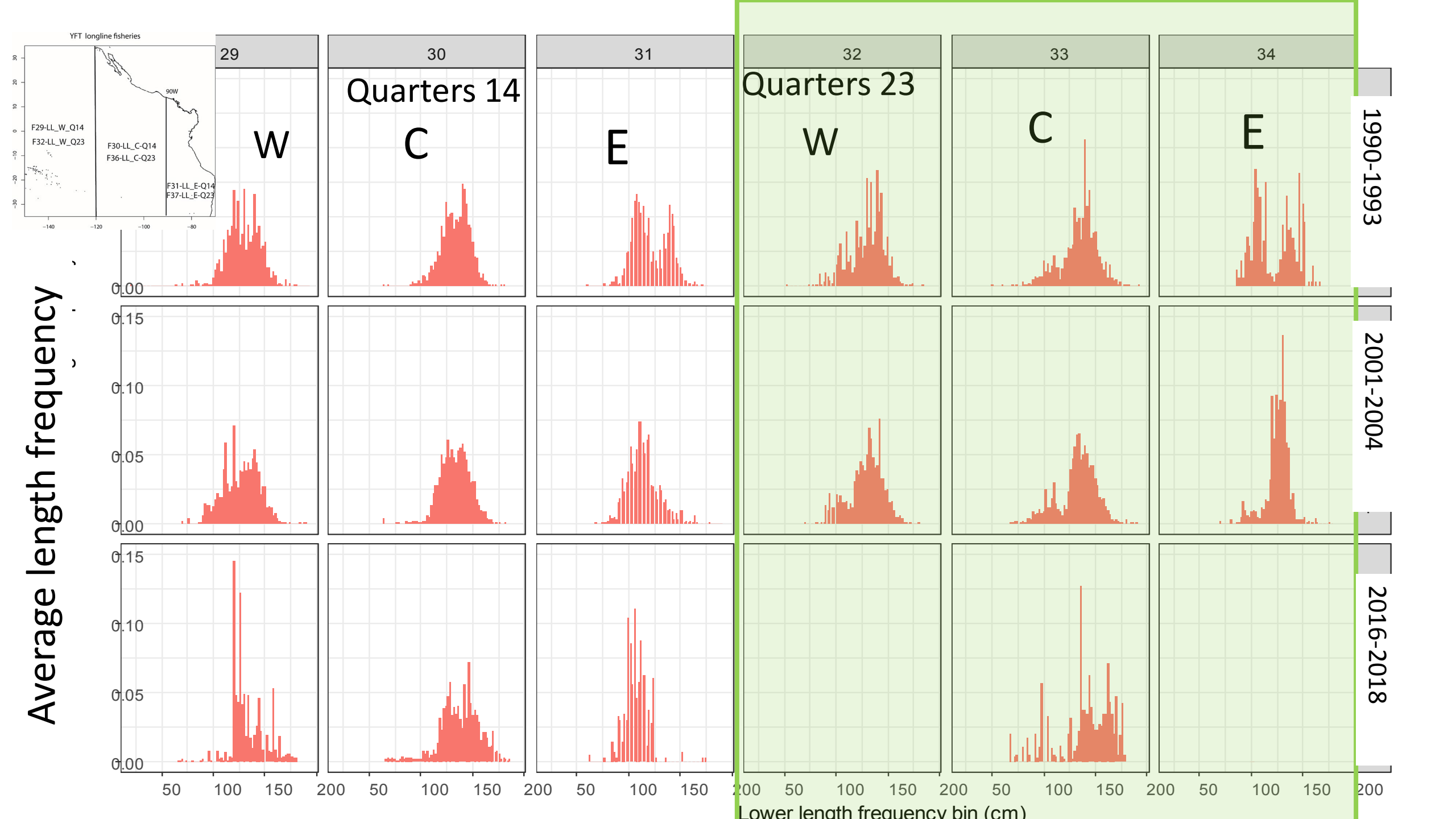


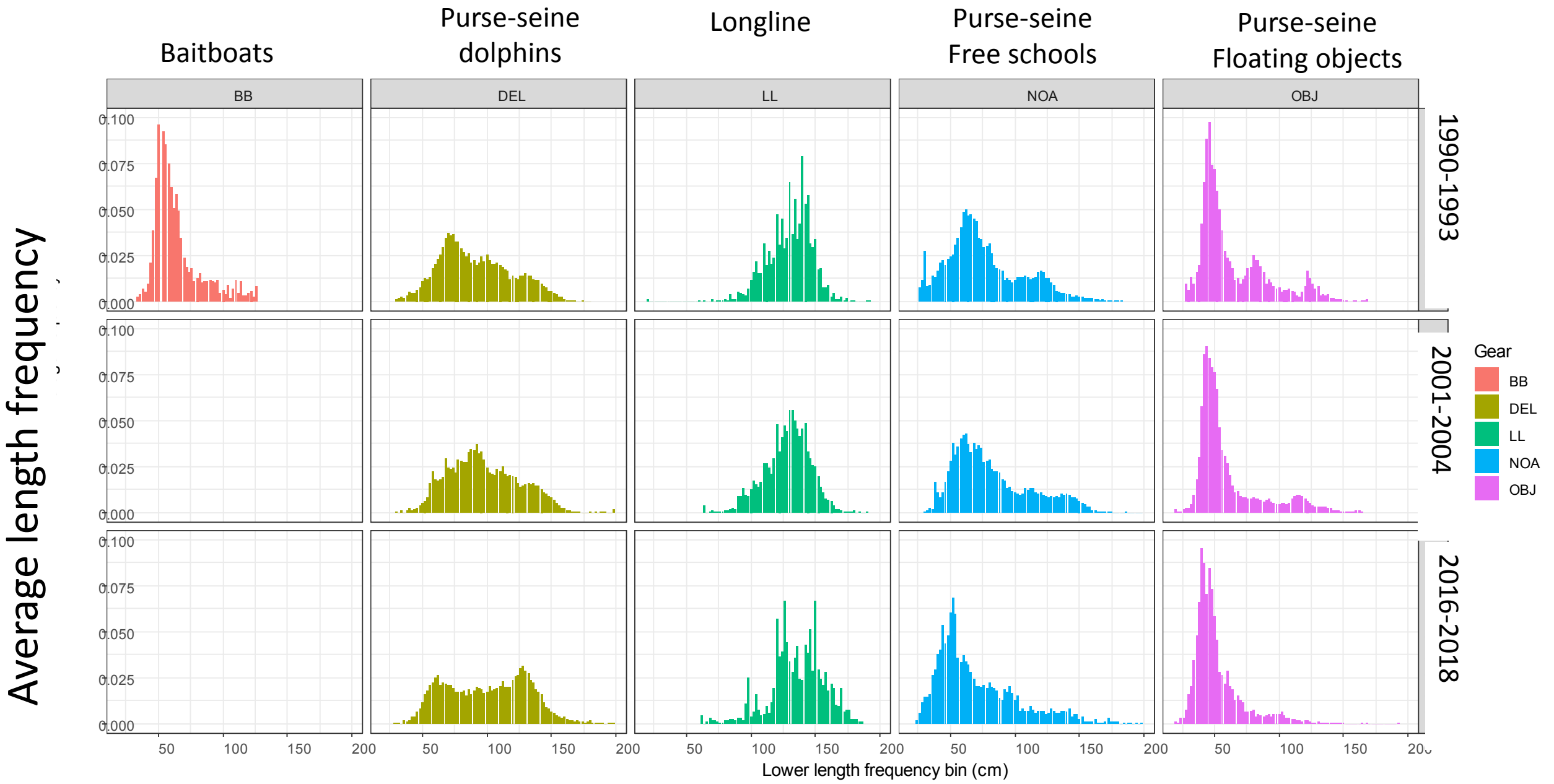


1990-1993

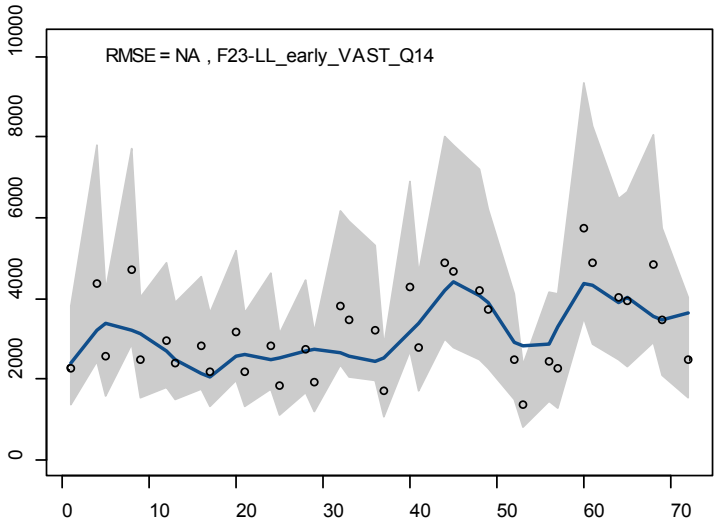
2001-2004

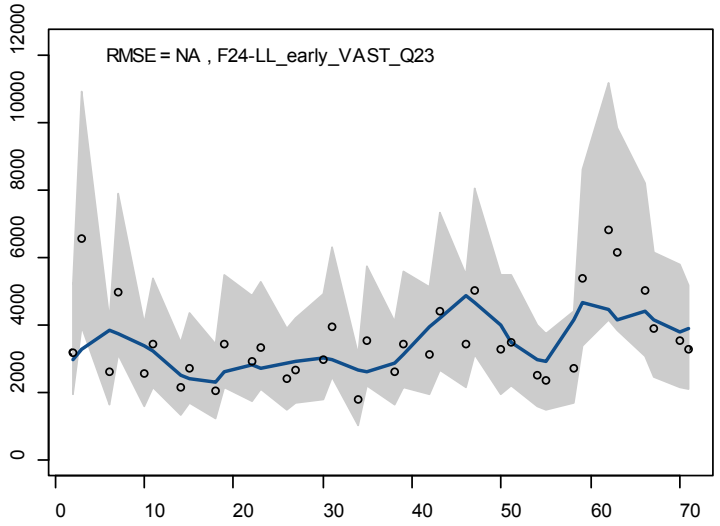
2016-2018

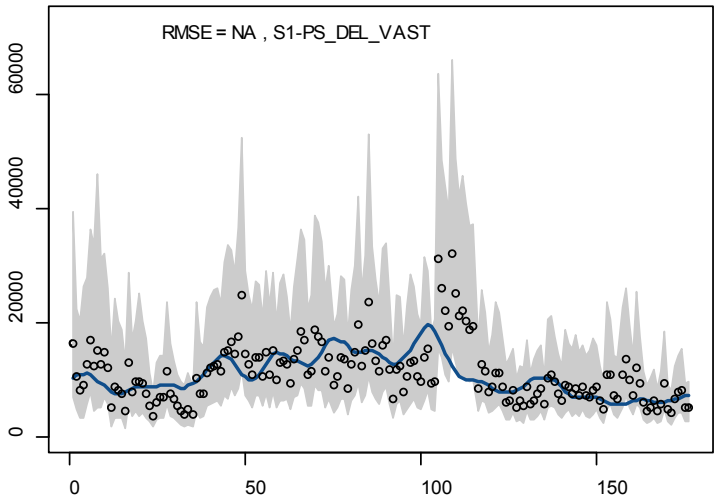

YFT longline fisheries
F29-LL_W_Q14
F32-LL_W_Q23
F30-LL_C-Q14
F36-LL_C-Q23
F31-LL_E-Q14
F37-LL_E-Q23
90W
29
30
31
32
33
34
Quarters 14
Quarters 23
W
C
E
1990-1993
2001-2004
2016-2018
Average length frequency
0.00
0.05
0.10
0.15
50
100
150
200
Lower length frequency bin (cm)

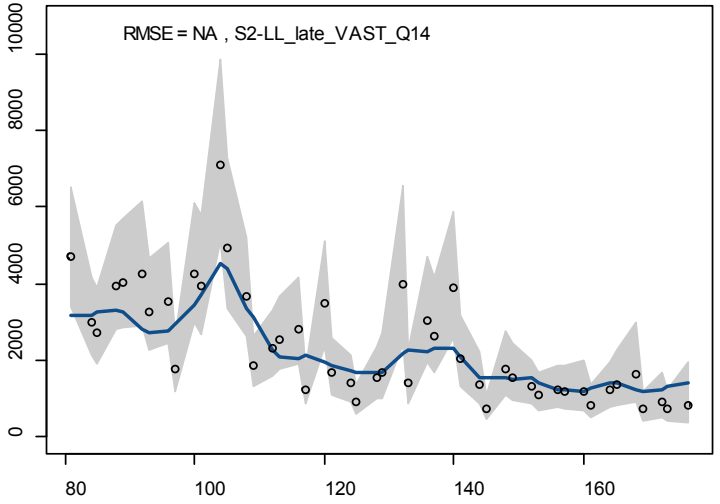

Baitboats
Purse-seine dolphins
Longline
Purse-seine Free schools
Purse-seine Floating objects
BB
DEL
LL
NOA
OBJ
1990-1993
2001-2004
2016-2018
Average length frequency
0.100
0.075
0.050
0.025
0.000
50
100
150
200
Lower length frequency bin (cm)
Gear
BB
DEL
LL
NOA
OBJ

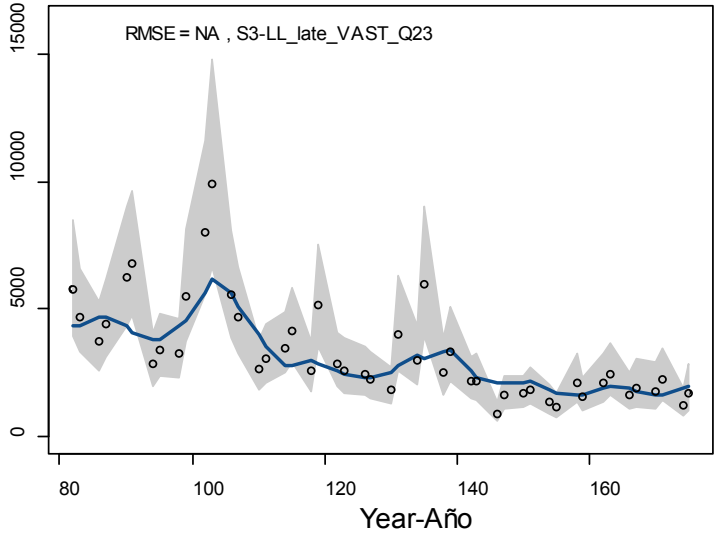
New EPO-wide model





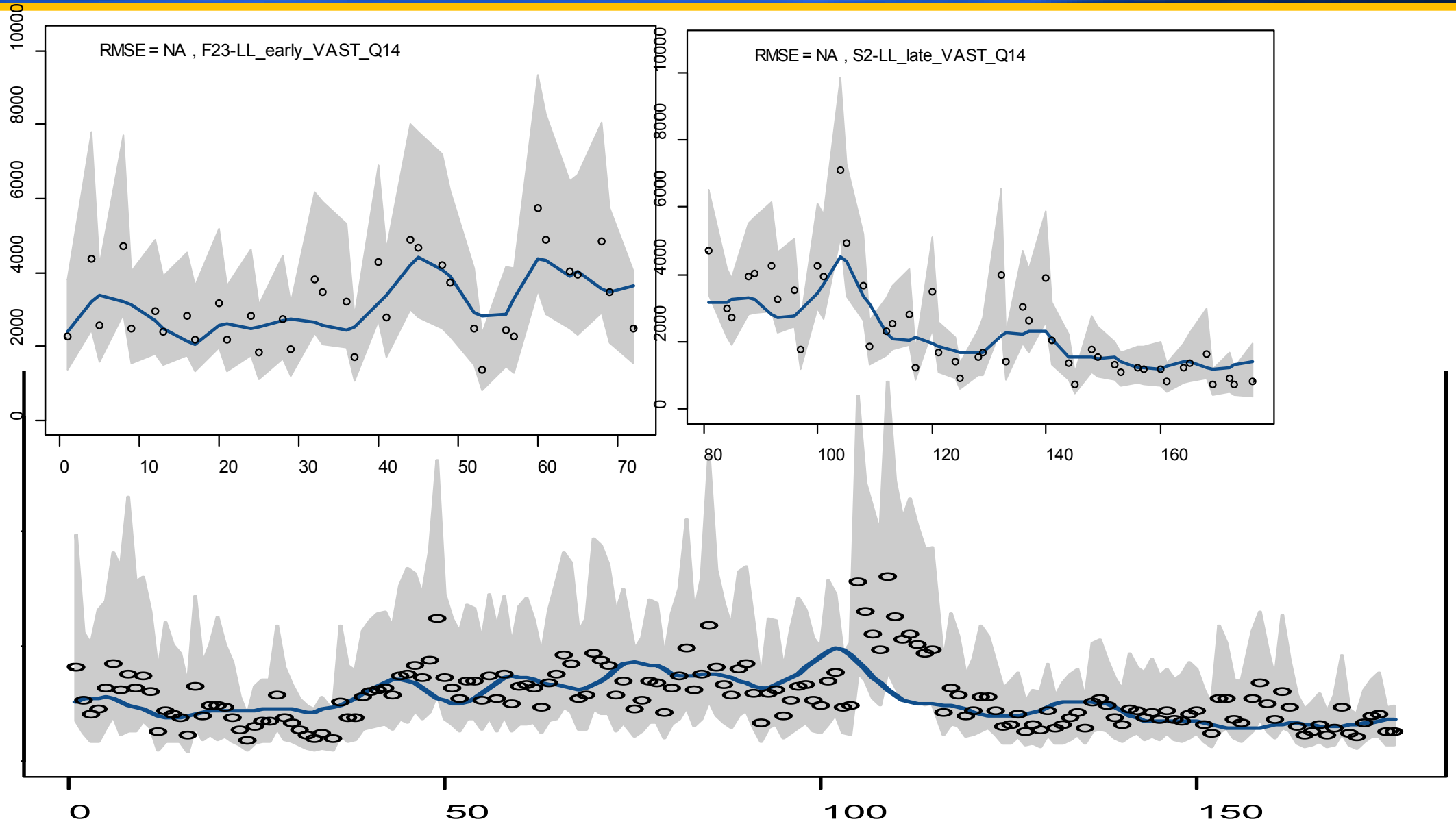




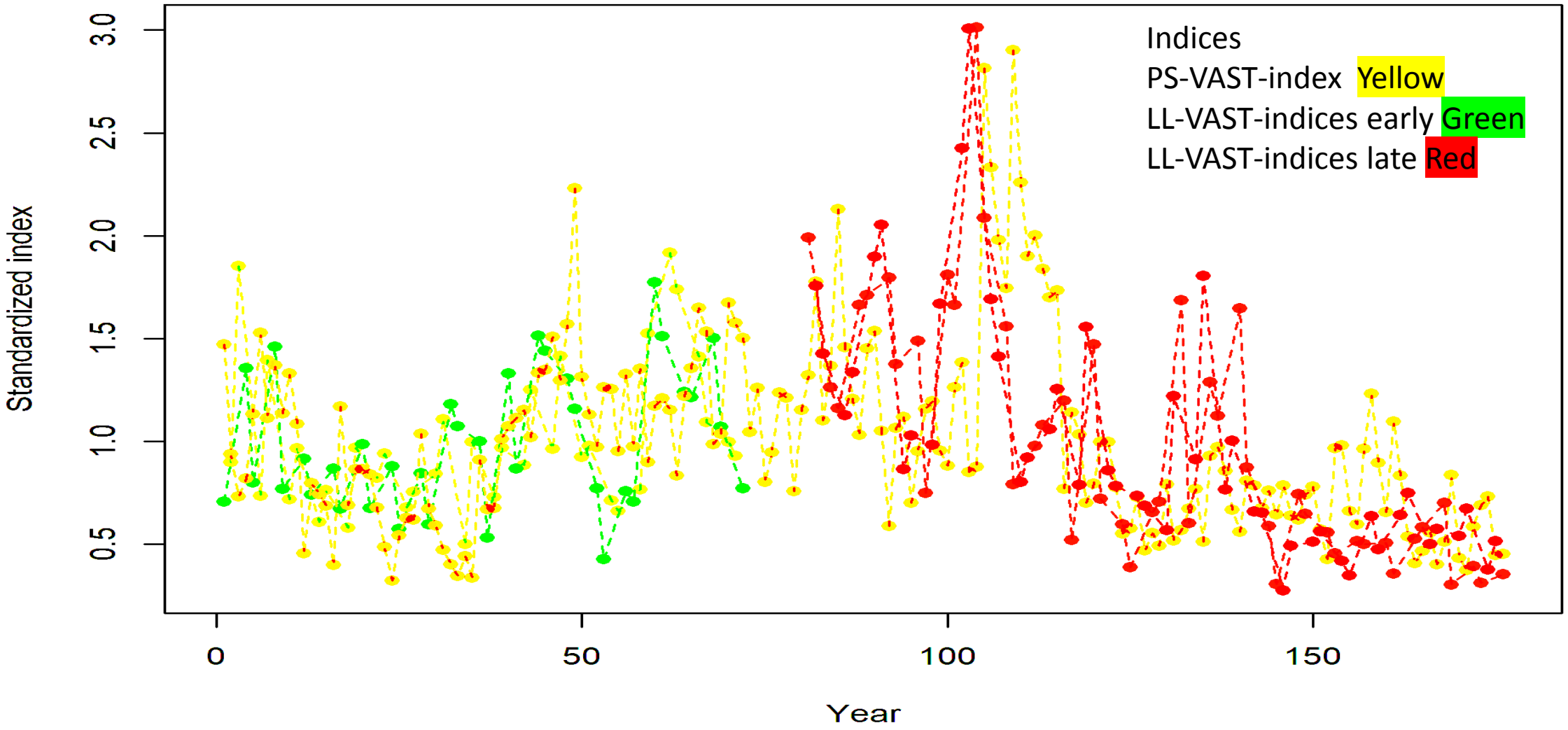


Index	RMSE	mean_input_SE	Input+extra
F23-LL_early_VAST_Q14	0.26	0.06	0.26
F24-LL_early_VAST_Q23	0.25	0.05	0.25
S1-PS-VAST	0.37	0.15	0.37
S2-LL_late_VAST_Q14	0.34	0.09	0.22
S3-LL_late_VAST_Q23	0.30	0.07	0.20

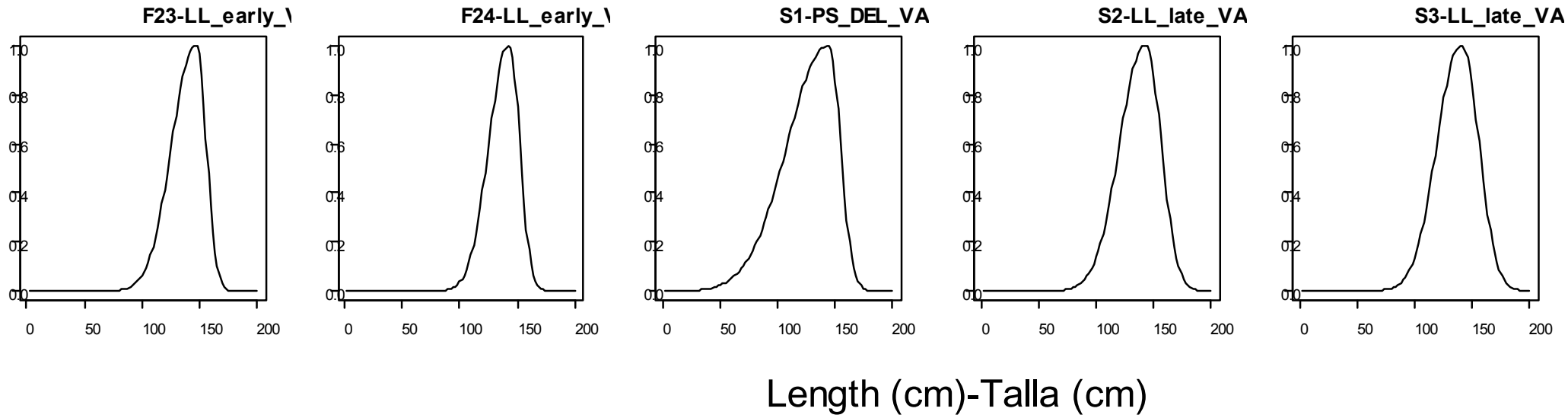
New EPO-wide model



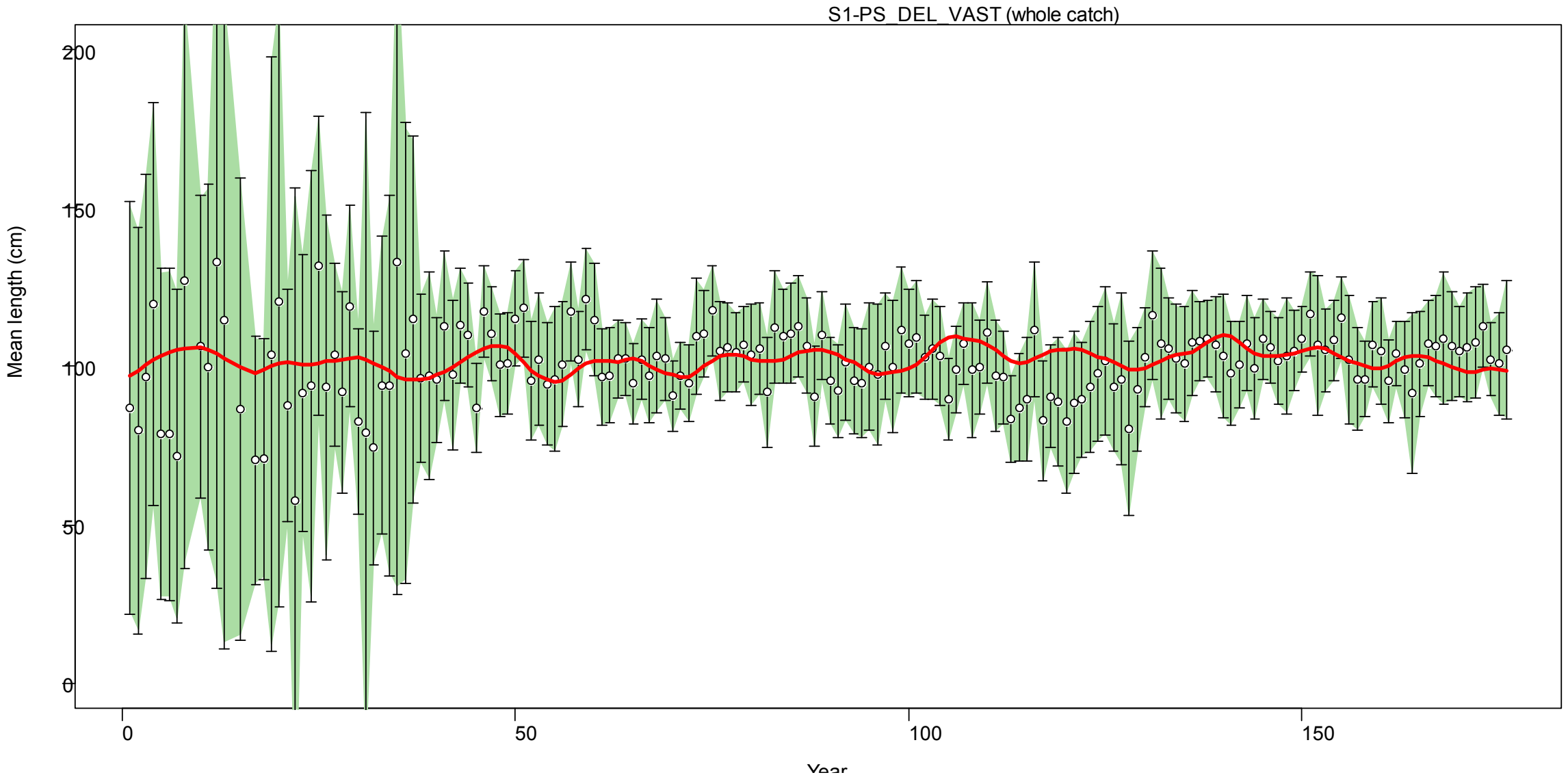
New EPO-wide model



New EPO-wide model



New EPO-wide model



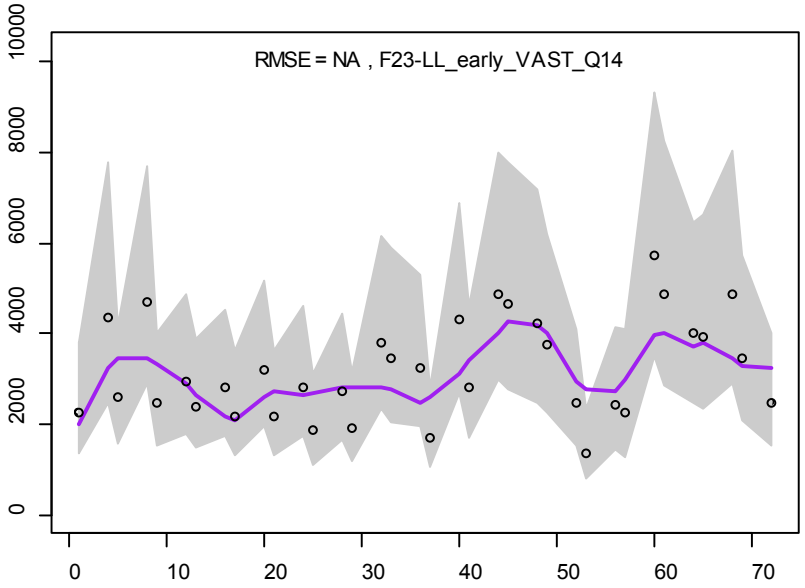
Results of the new EPO-wide model

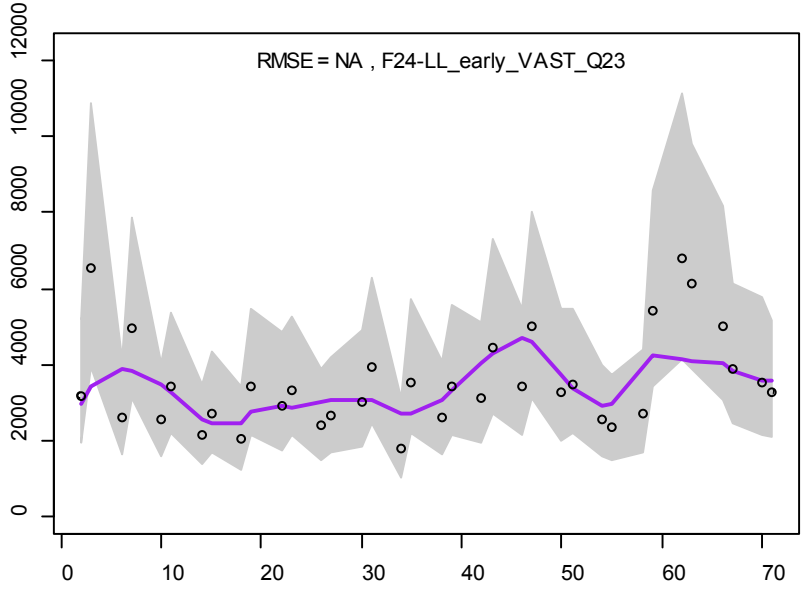
Fit to **LL_VAST** x lambda= 100 (CV=0.20)

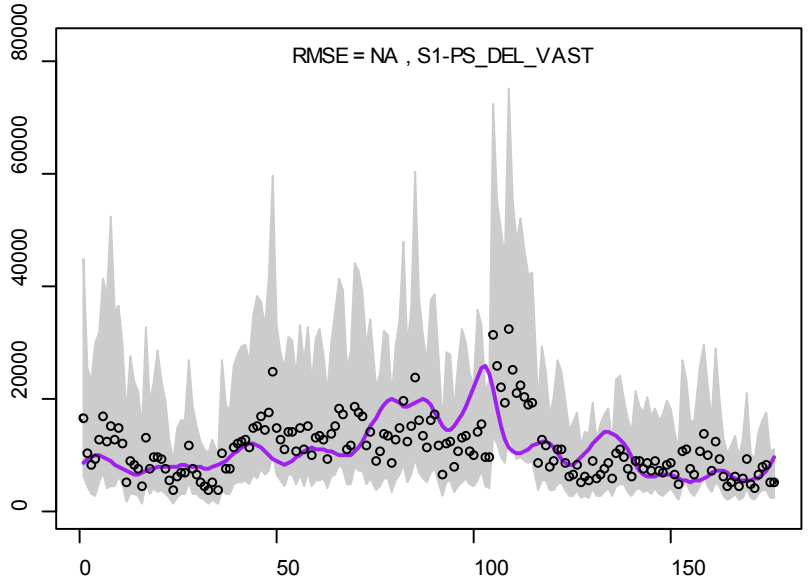
Or

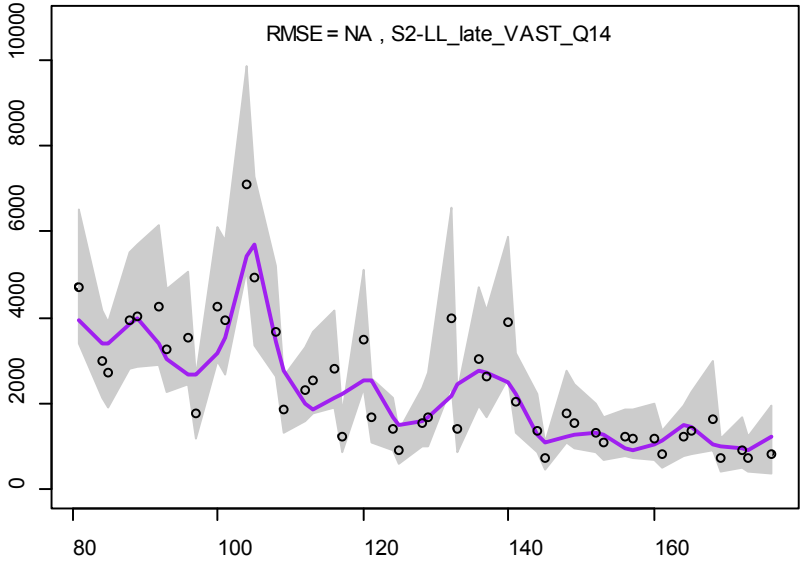
Fit to **PS_VAST** x lambda= 100 (CV=0.20)

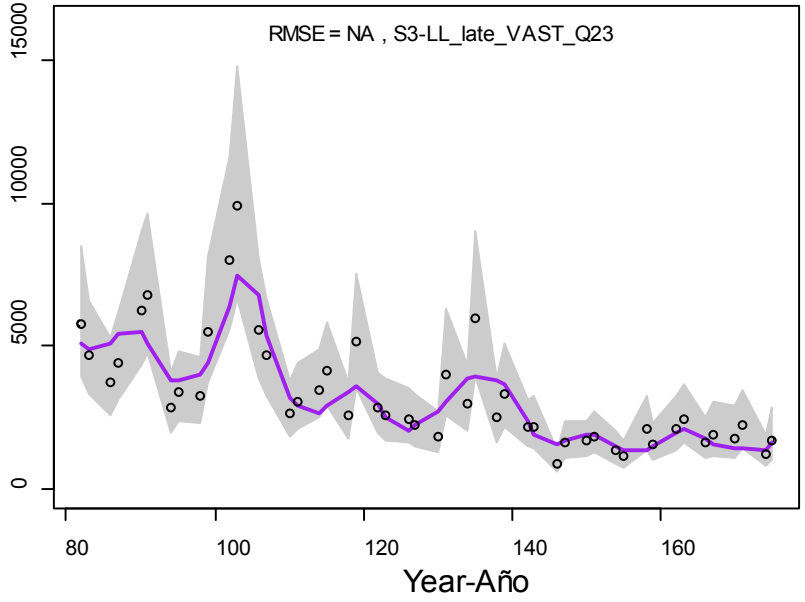
Main Index: LL_VAST X 100





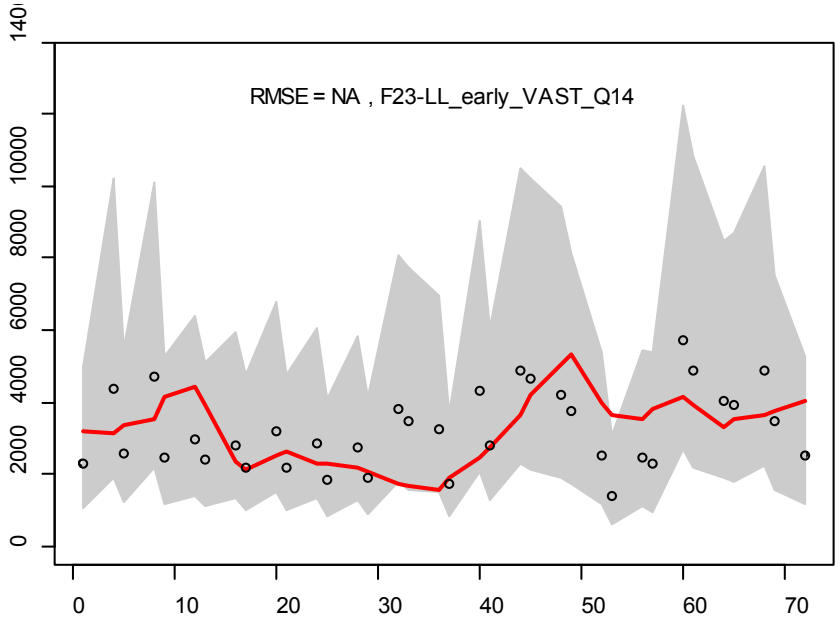


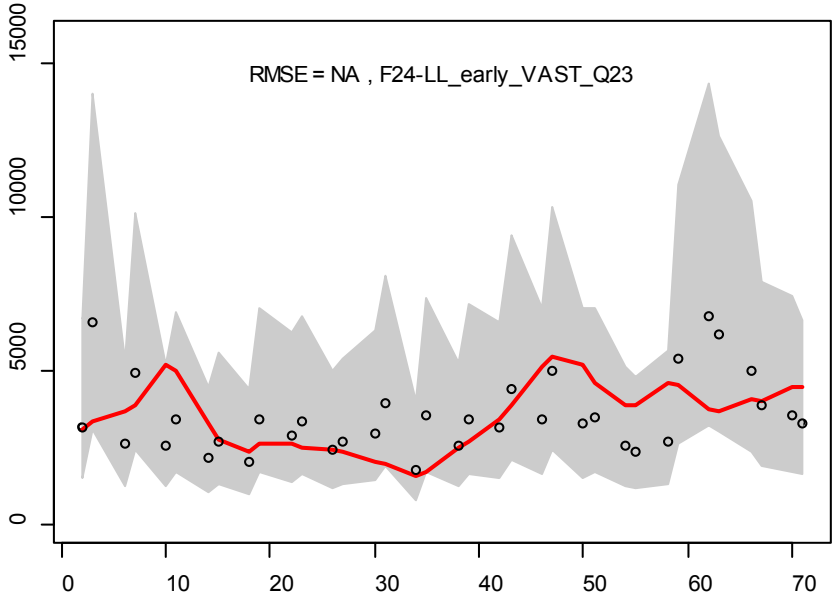


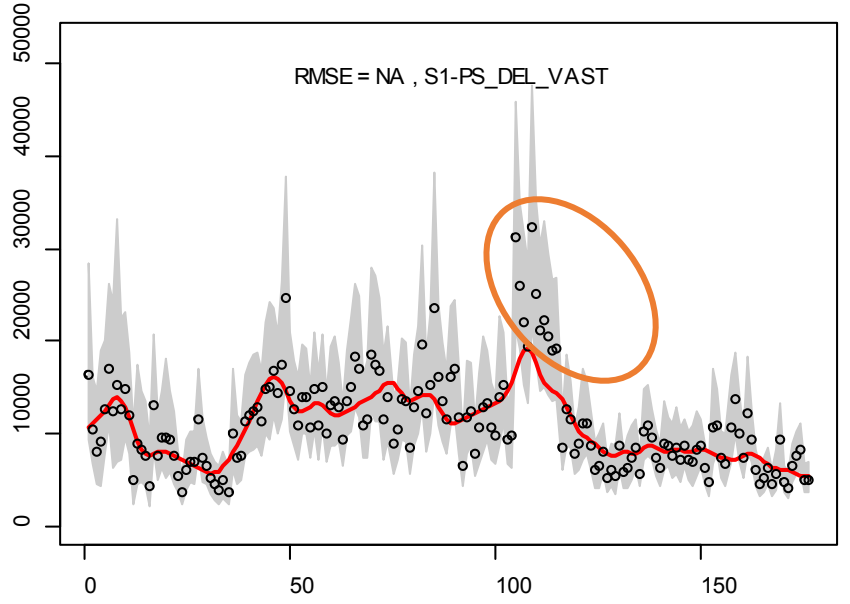


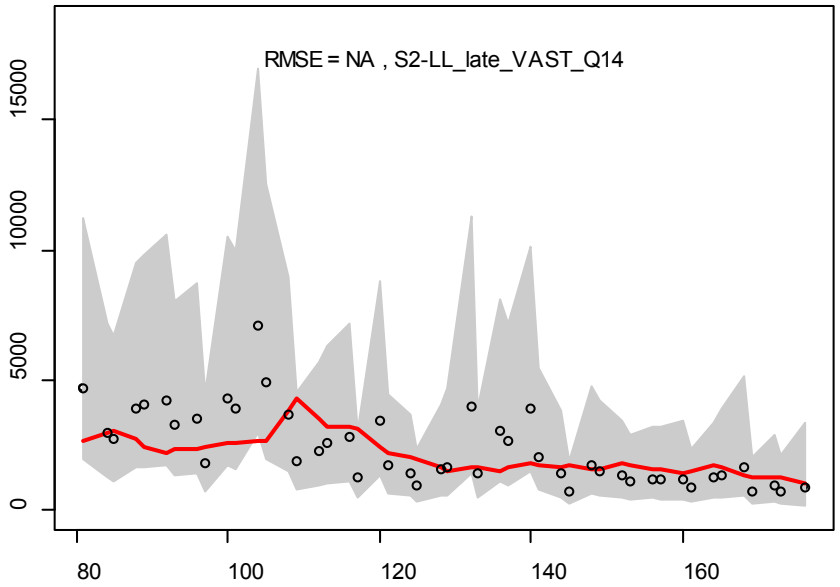
Even when the strongest emphasis is given to LL_VAST indices (λ =100, CV=0.2), the model is not able follow most of the PS_VAST index, almost total mismatch.

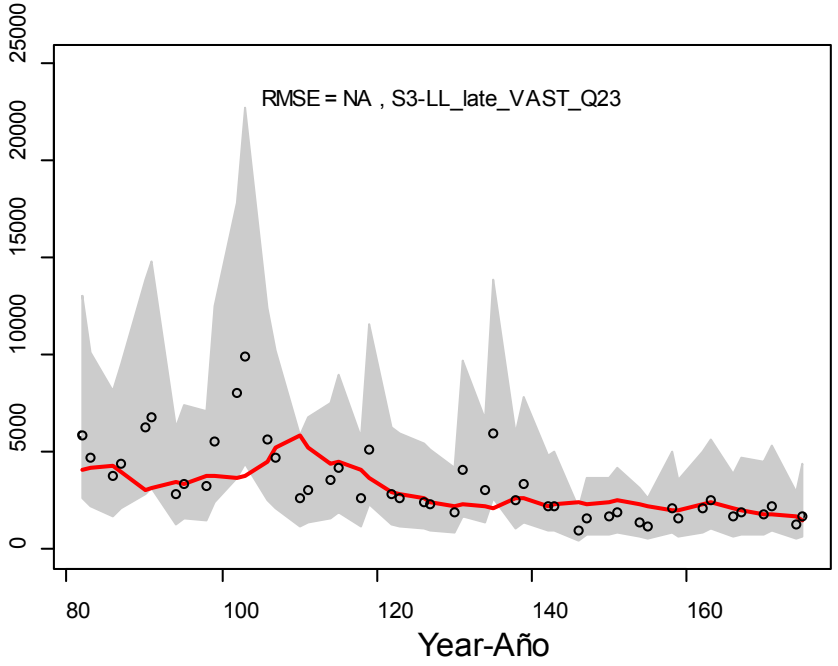
Main Index: PS_VAST X 100







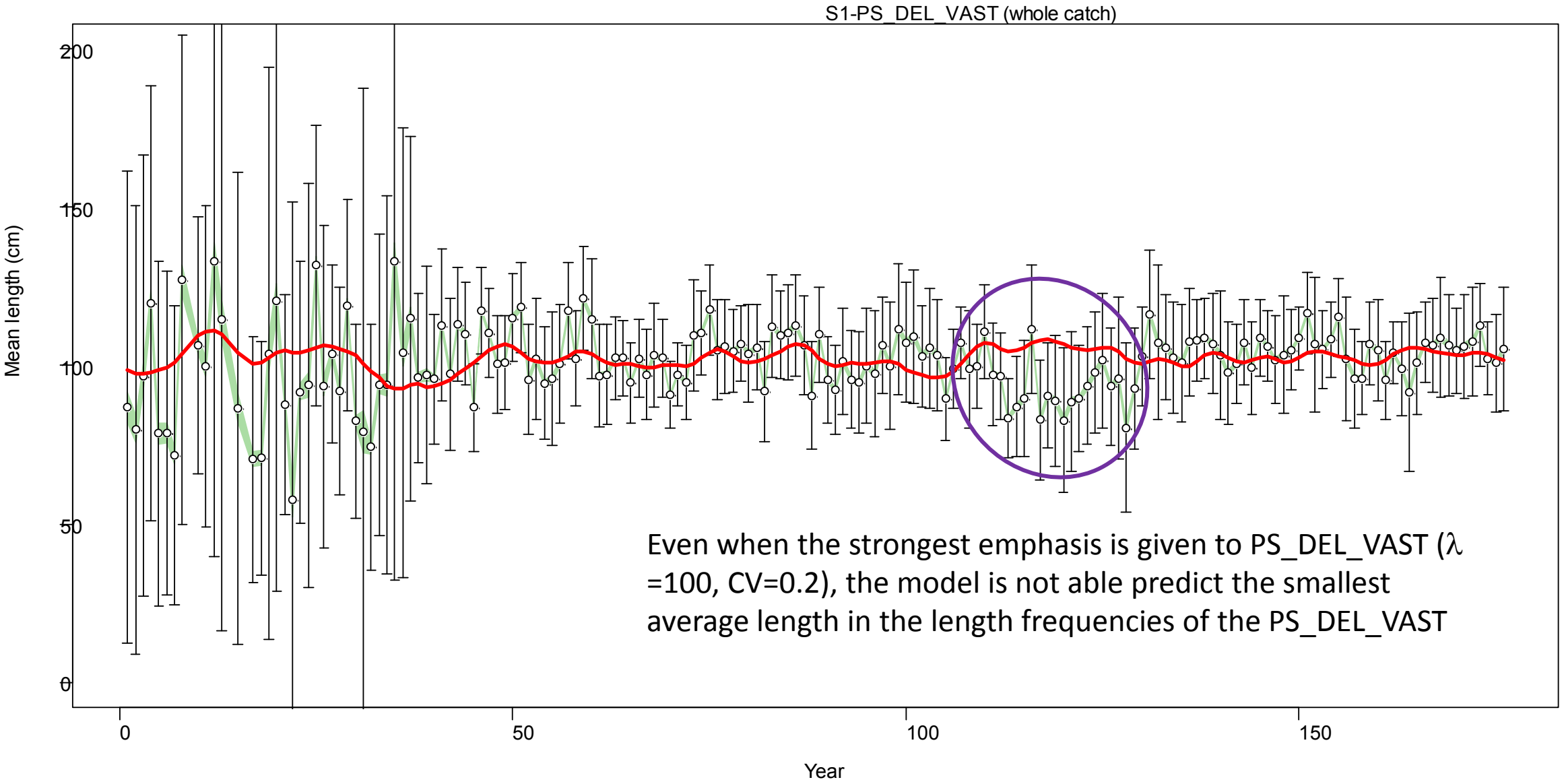




Even when the strongest emphasis is given to PS_DEL_VAST (λ =100, CV=0.2), the model is not able to fit the largest values

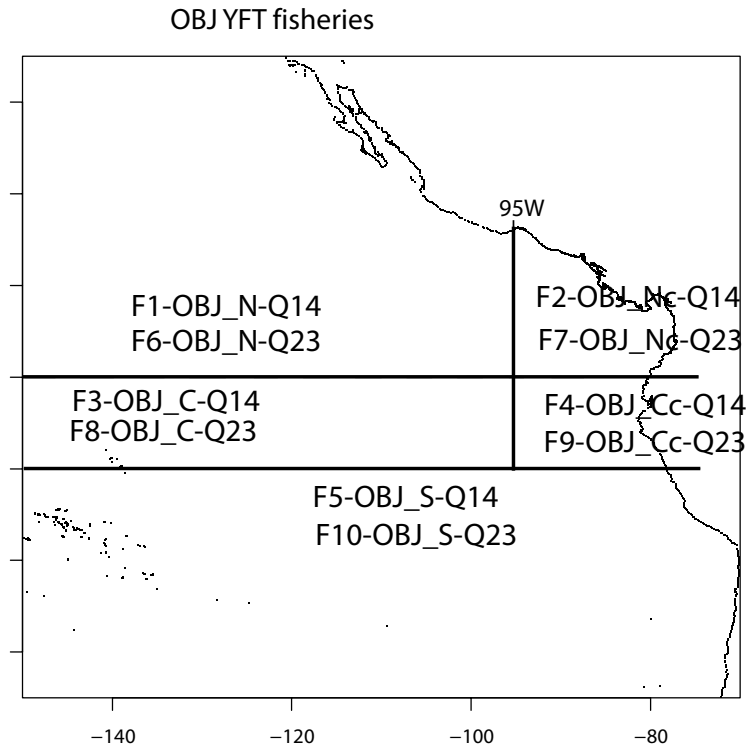
The LL indices are not well fit

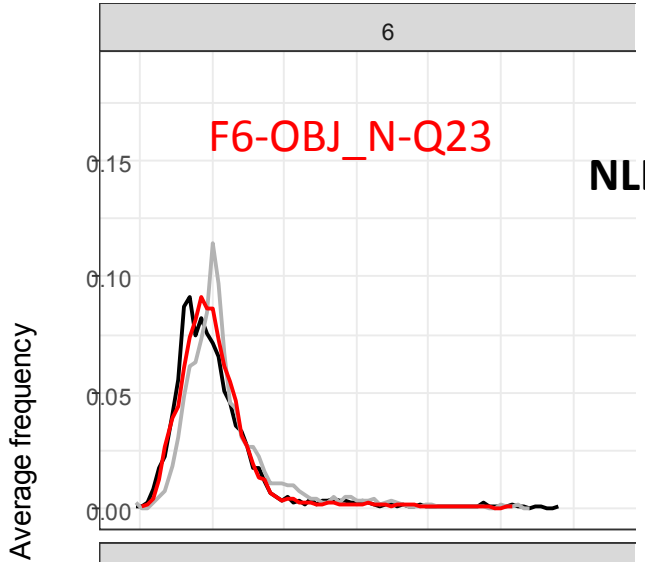
Results of the new EPO-wide model



Even when the strongest emphasis is given to PS_DEL_VAST (λ =100, CV=0.2), the model is not able predict the smallest average length in the length frequencies of the PS_DEL_VAST

PS Floating objects OBJ – LF



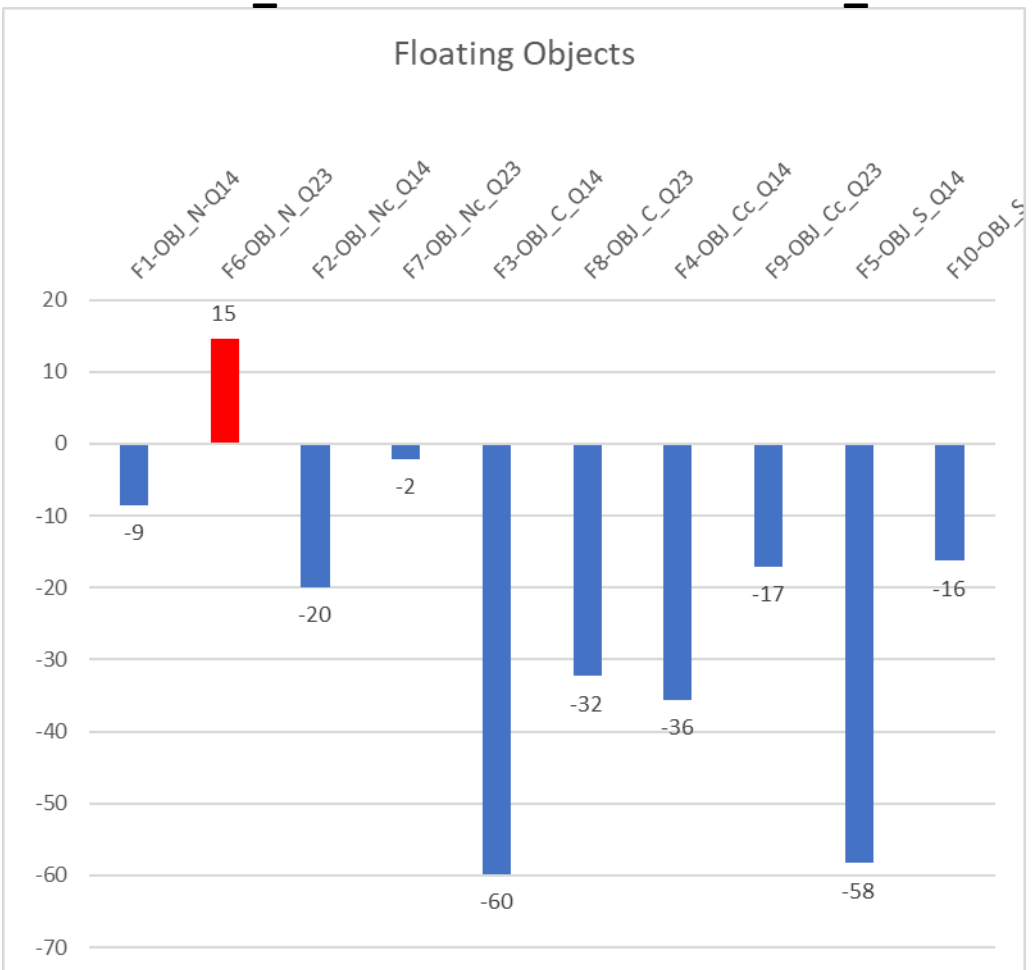


PS_VAST

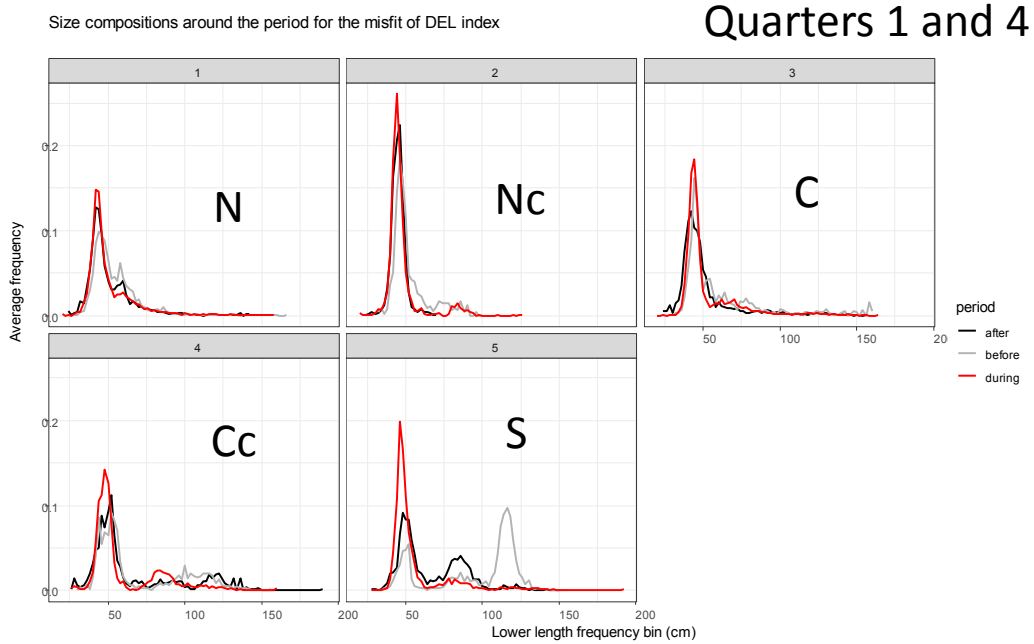
The model fits the PS-OJ LF data better when emphasis is given to the index:

LL VAST

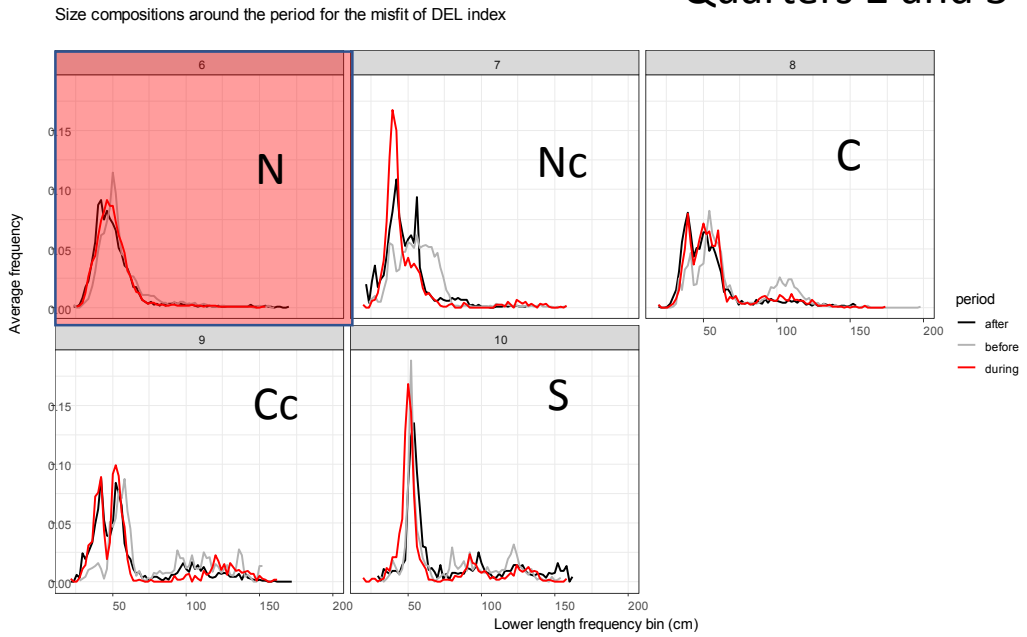
NLL Run with LL_VAST *100- NLL Run with PS_VAST *100

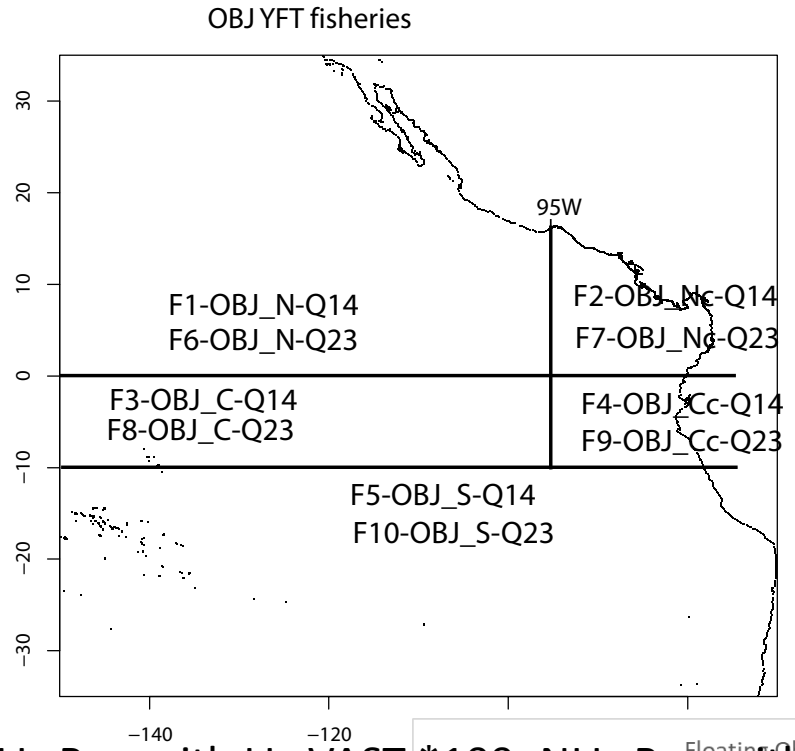


Quarters 1 and 4



Quarters 2 and 3

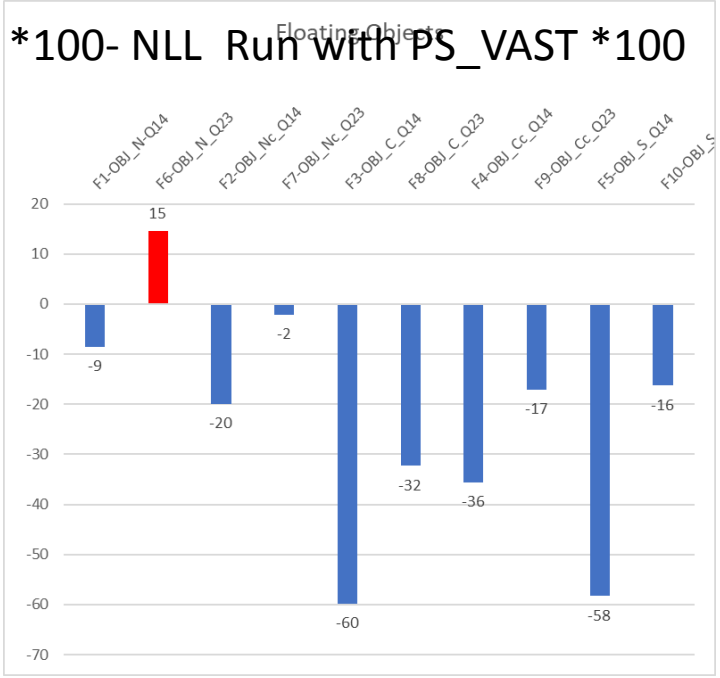




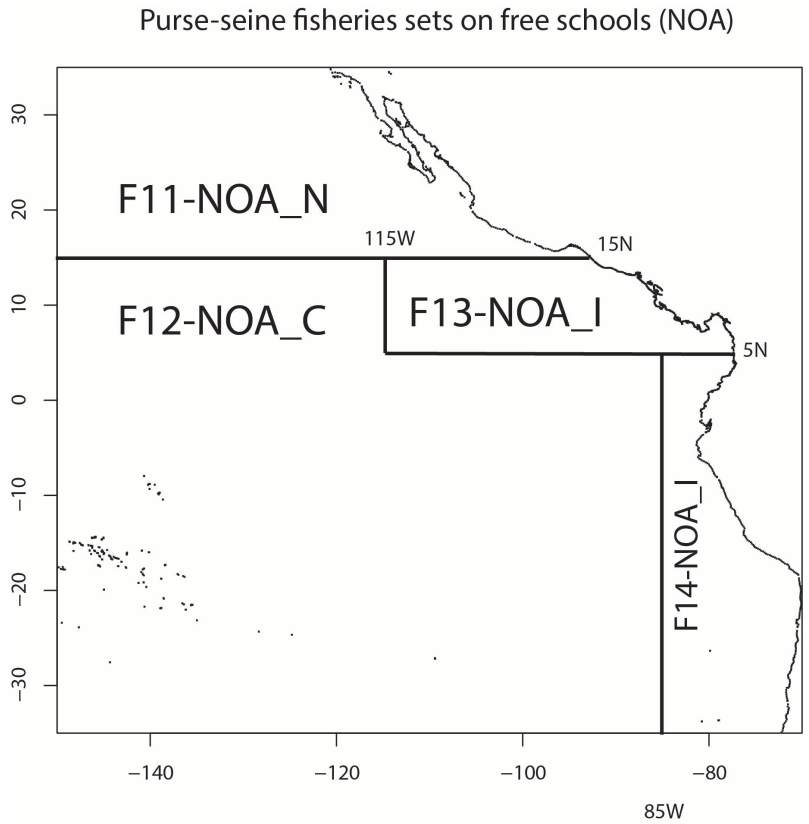
NLL Run with LL_VAST *100- NLL Run with PS_VAST *100

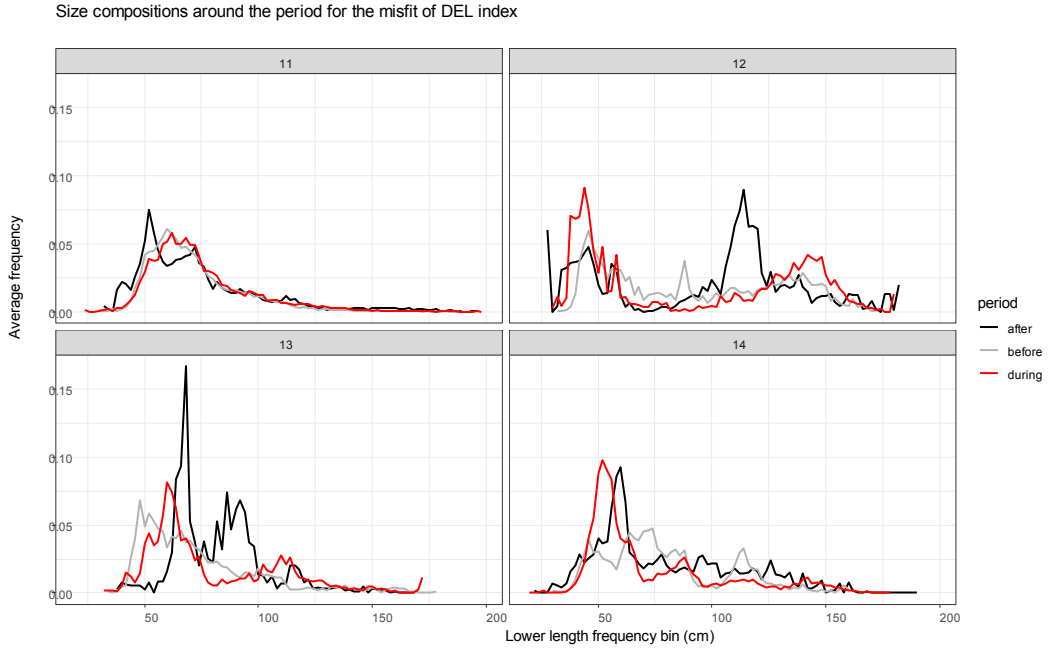
PS_VAST

LL VAST



PS Free schools (NOA) - L

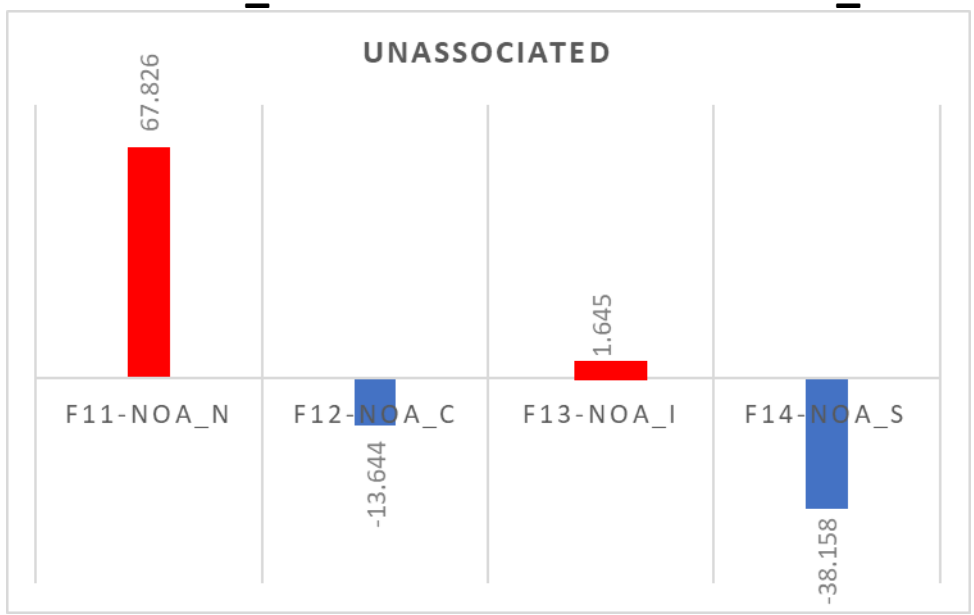




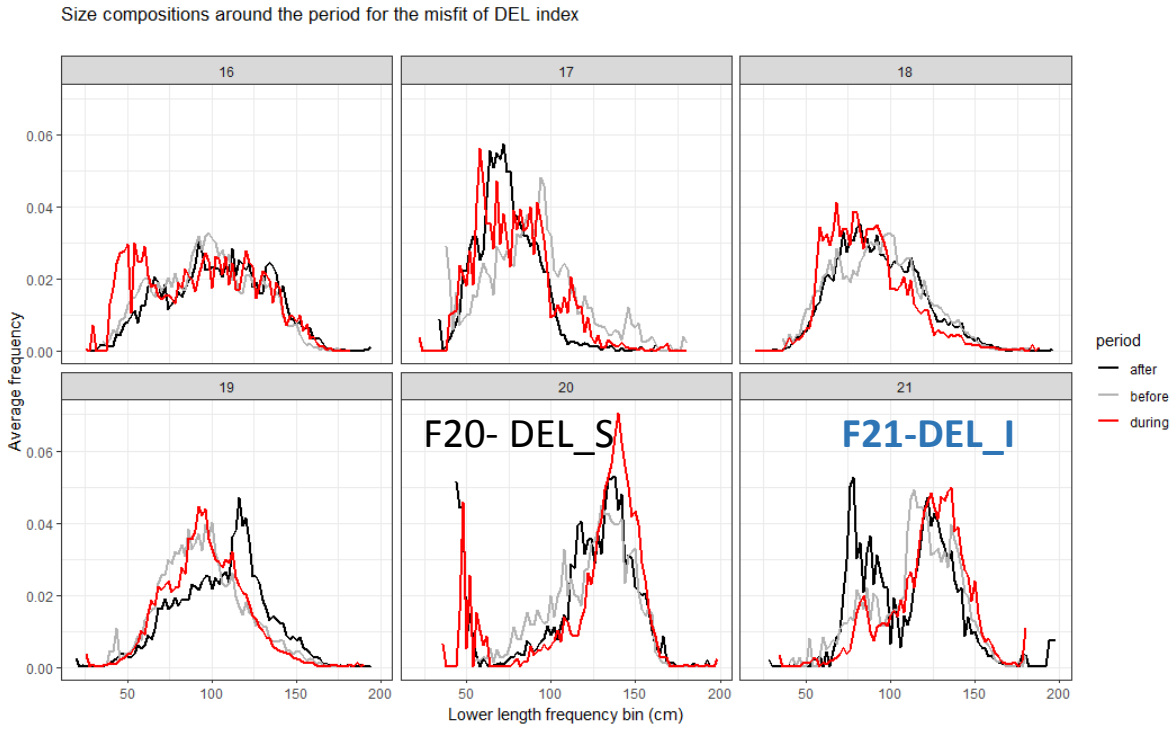
NLL Run with LL_VAST *100- NLL Run with PS_VAST *100

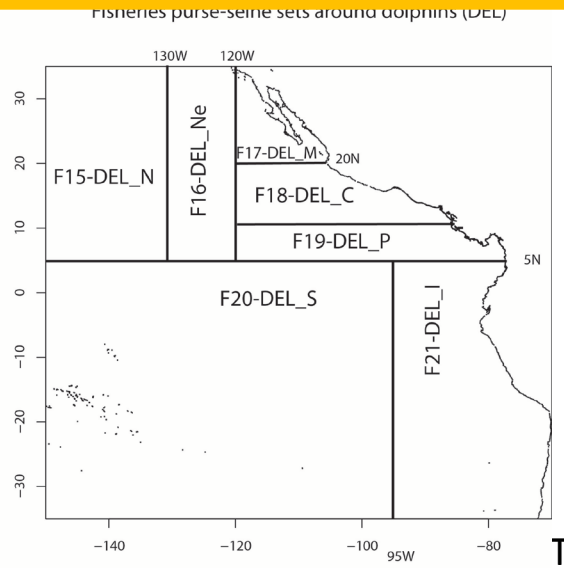
PS_VAST

LL VAST



PS Dolphin sets (DEL)



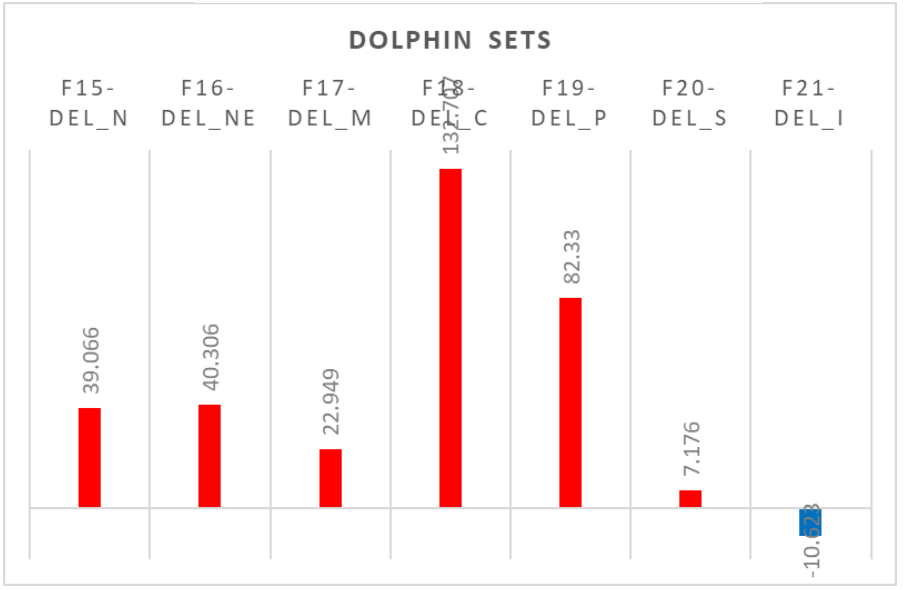


NLL Run with LL_V T *100

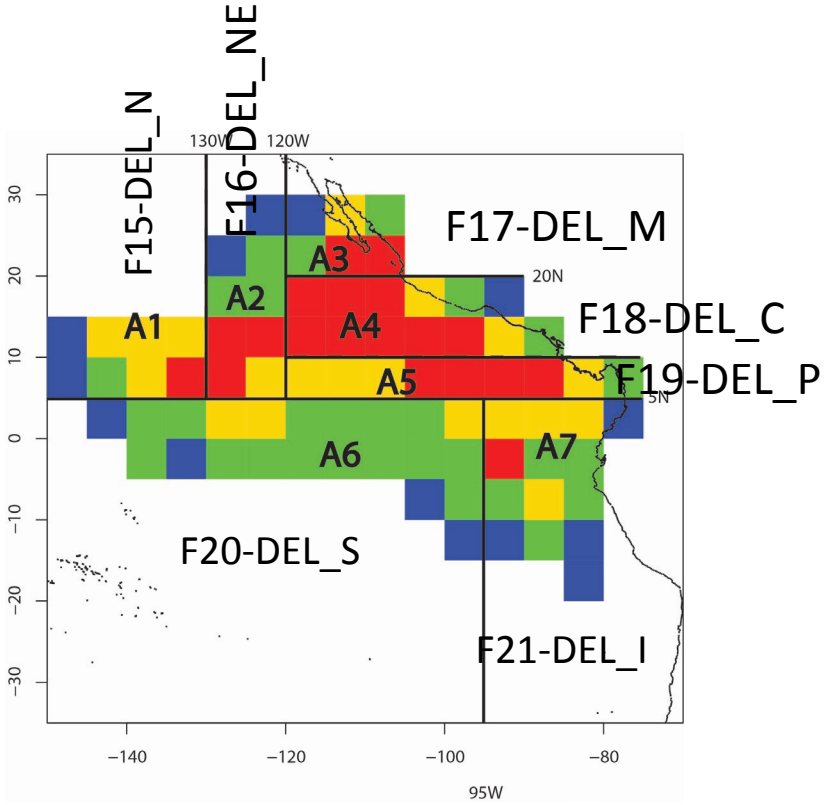
PS_VAST

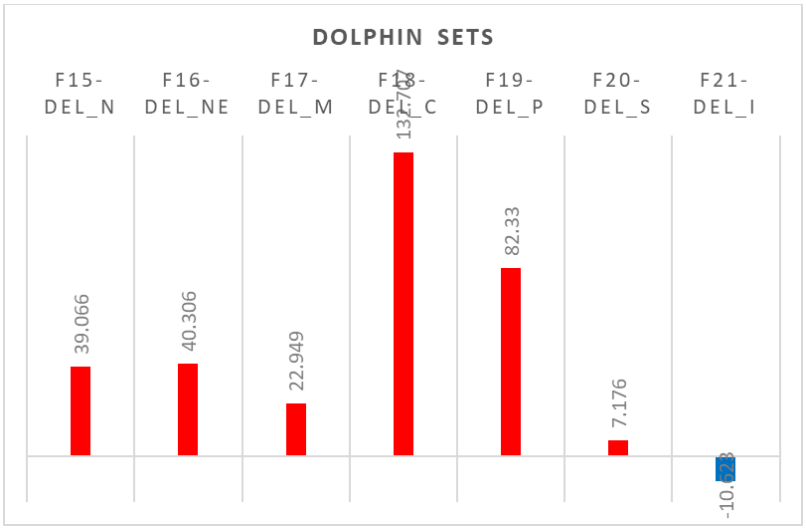
fits the PS-OJ LF
r when emphasis
the index:

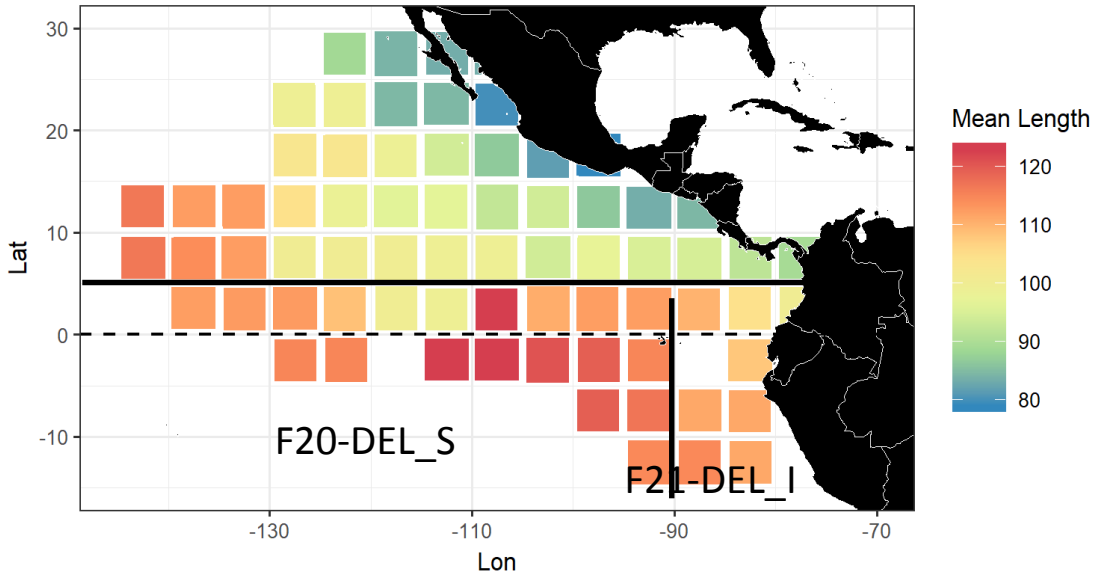
LL VAST

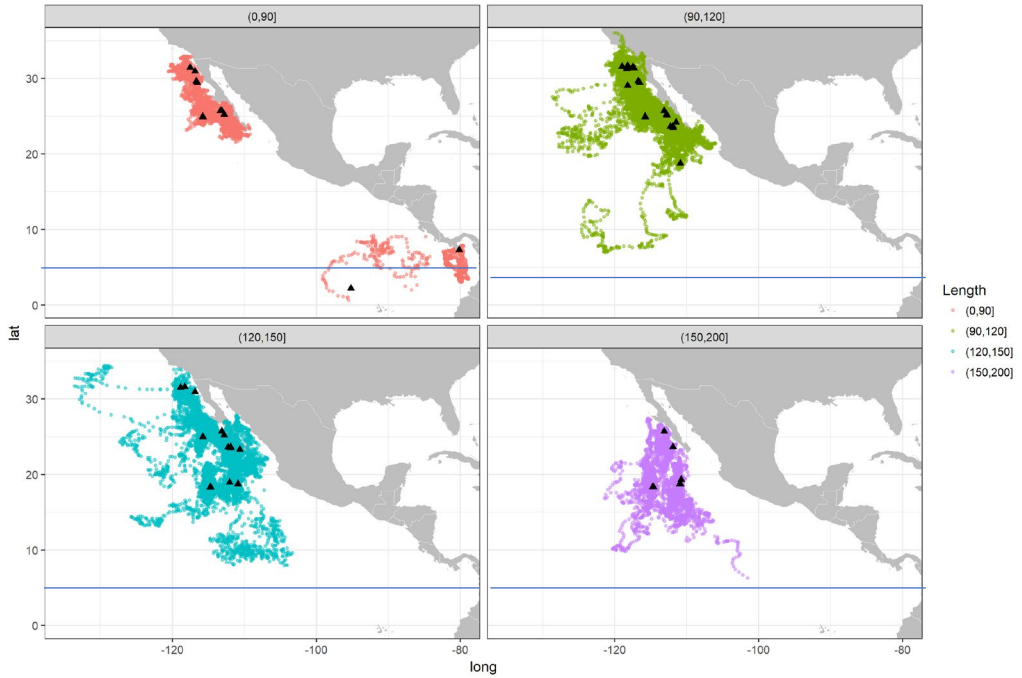


PS_VAST

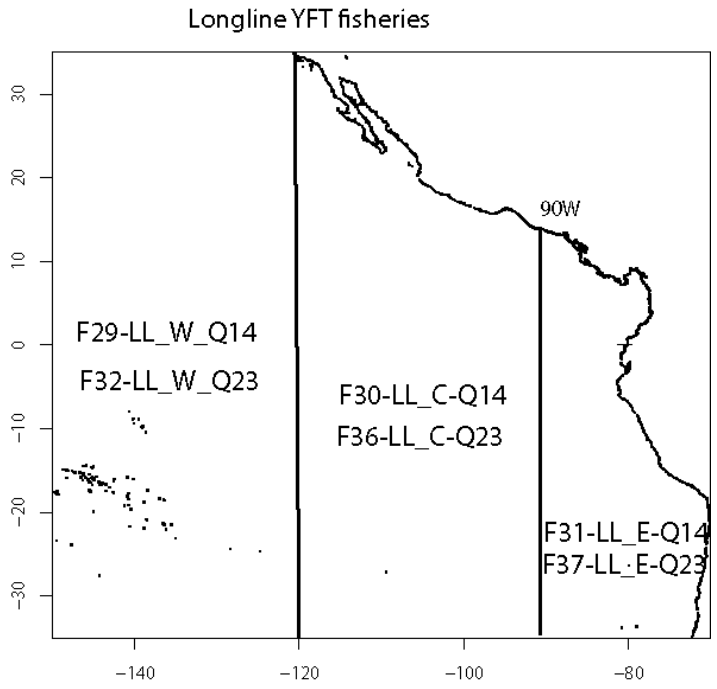

F15-DEL_N
F16-DEL_NE
F17-DEL_M
F18-DEL_C
F19-DEL_P
F20-DEL_S
F21-DEL_I
A1
A2
A3
A4
A5
A6
A7
130W
120W
20N
5N
95W


DOLPHIN SETS
F15-DEL_N
F16-DEL_NE
F17-DEL_M
F18-DEL_C
F19-DEL_P
F20-DEL_S
F21-DEL_I
39.066
40.306
22.949
82.33
7.176


Mean Length
120
110
100
90
80
Lat
Lon
F20-DEL_S
F21-DEL_I


(0,90]
(90,120]
(120,150]
(150,200]
Length
lat
long

Longline fisheries

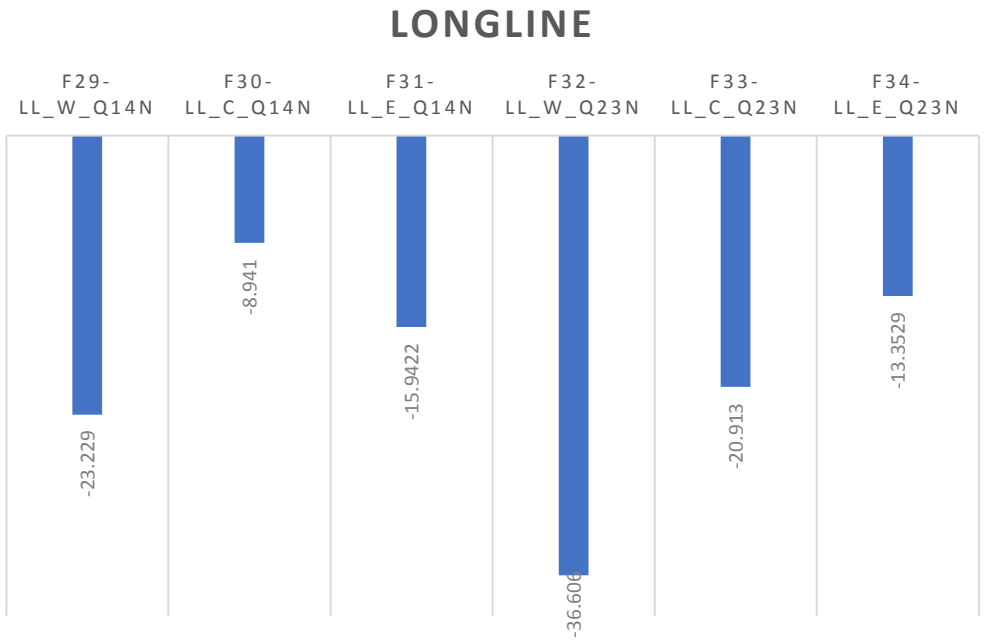


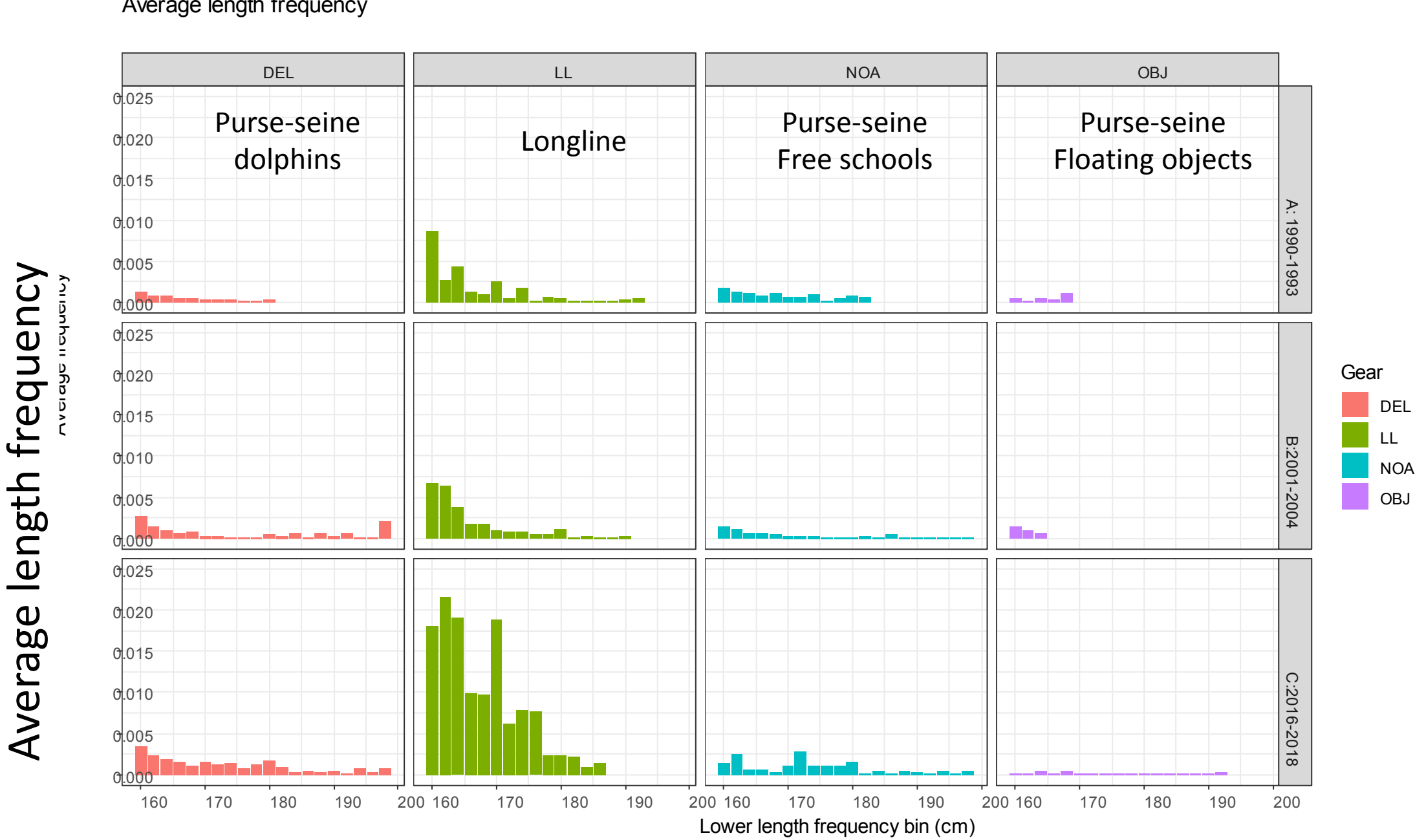
The model fits the PS-OJ LF data better when emphasis is given to the index:

PS_VAST

LL VAST

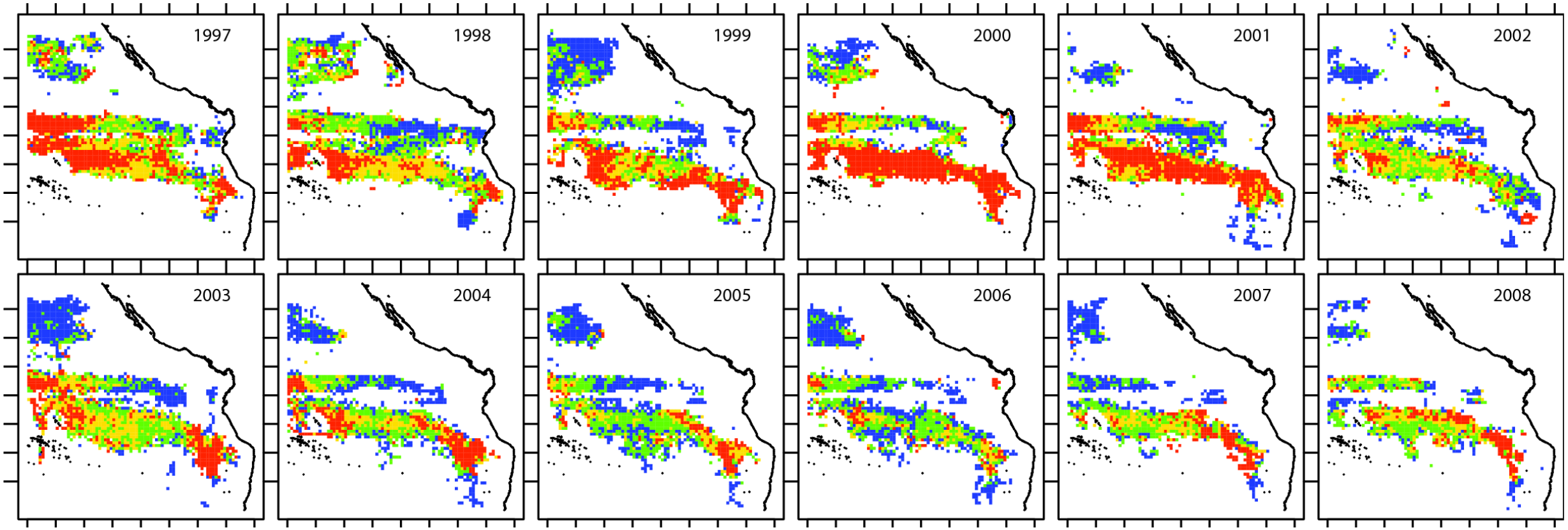
NLL Run with LL_VAST *100- NLL Run with PS_VAST *100



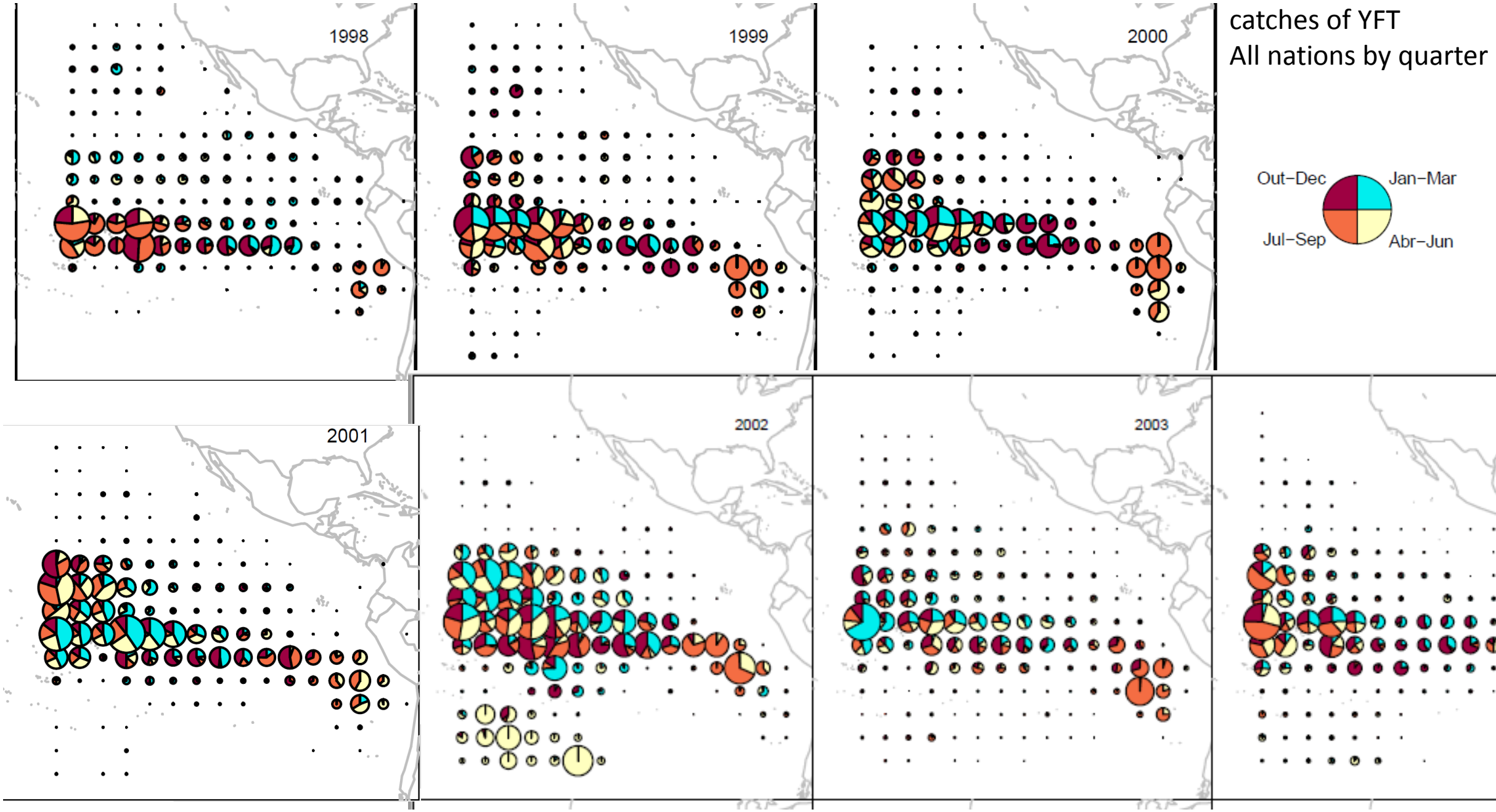

Average length frequency
DEL
LL
NOA
OBJ
Purse-seine dolphins
Longline
Purse-seine Free schools
Purse-seine Floating objects
A: 1990-1993
B:2001-2004
C:2016-2018
0.025
0.020
0.015
0.010
0.005
0.000
160
170
180
190
200
Lower length frequency bin (cm)
Gear
DEL
LL
NOA
OBJ

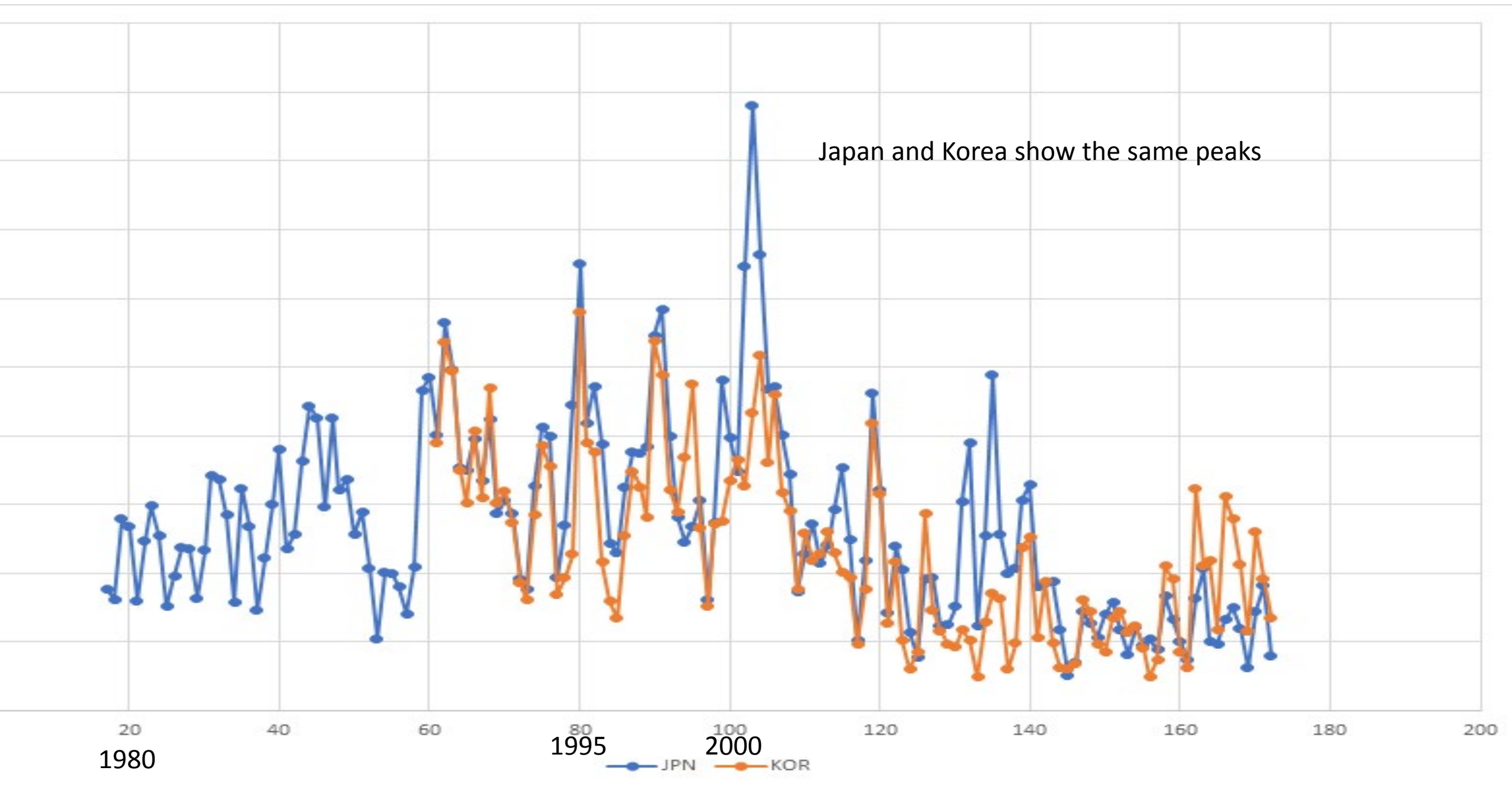
Fish >= 160 cm

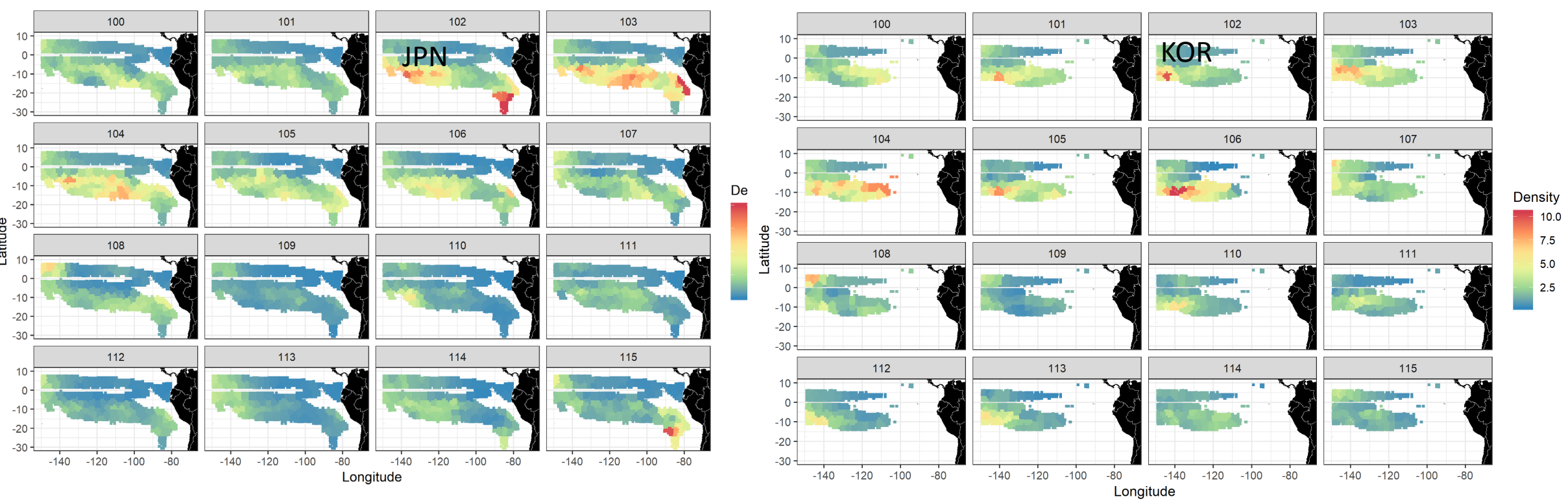
Japanese longline fleet



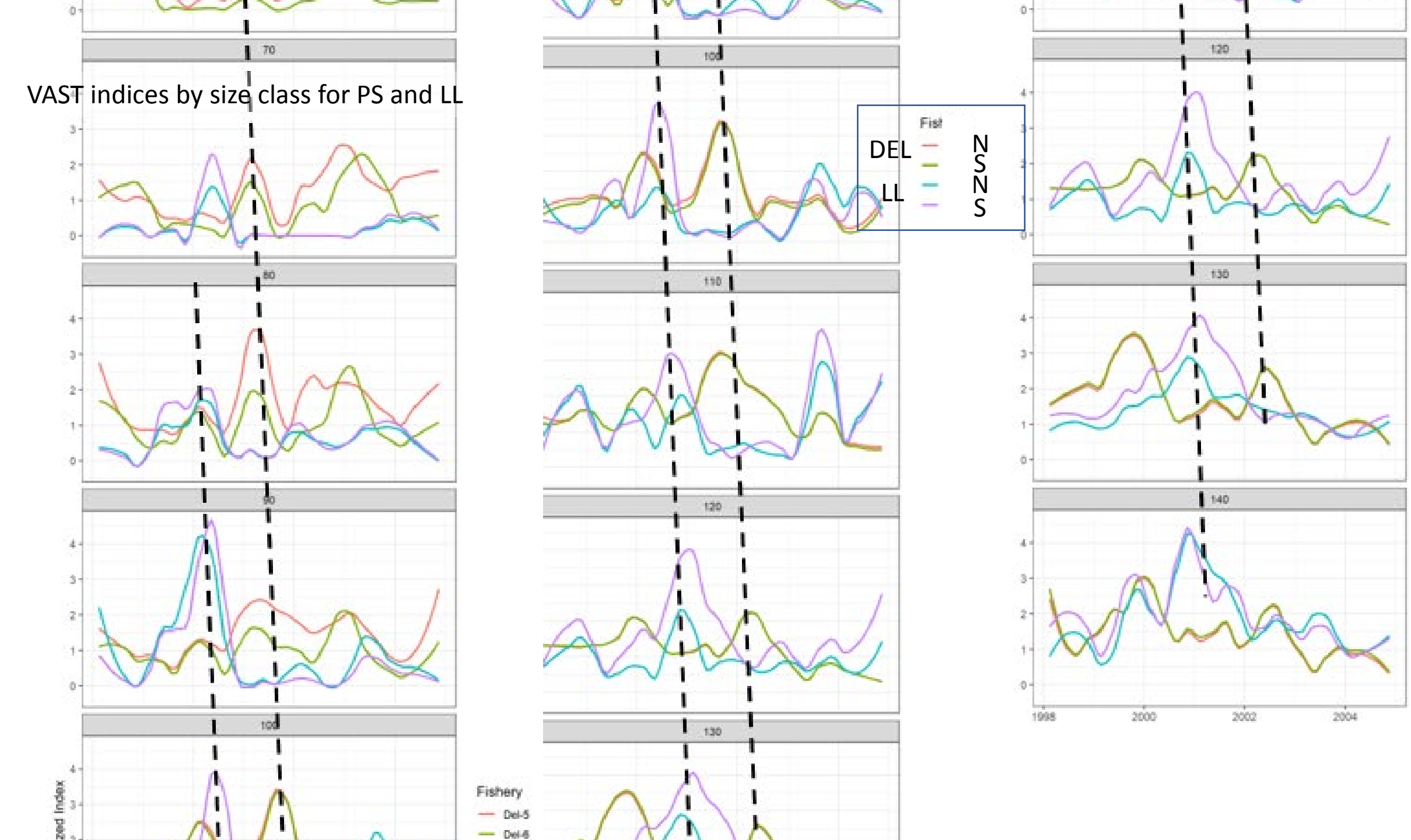
Yellowfin tuna
Average CPUE (number per hook)
blue: < 0.0006
green: 0.0006 - 0.0017
gold: 0.0017 - 0.0030
red: > 0.0030


Longline
catches of YFT
All nations by quarter
Out–Dec
Jan–Mar
Jul–Sep
Abr–Jun
1998
1999
2000
2001
2002
2003

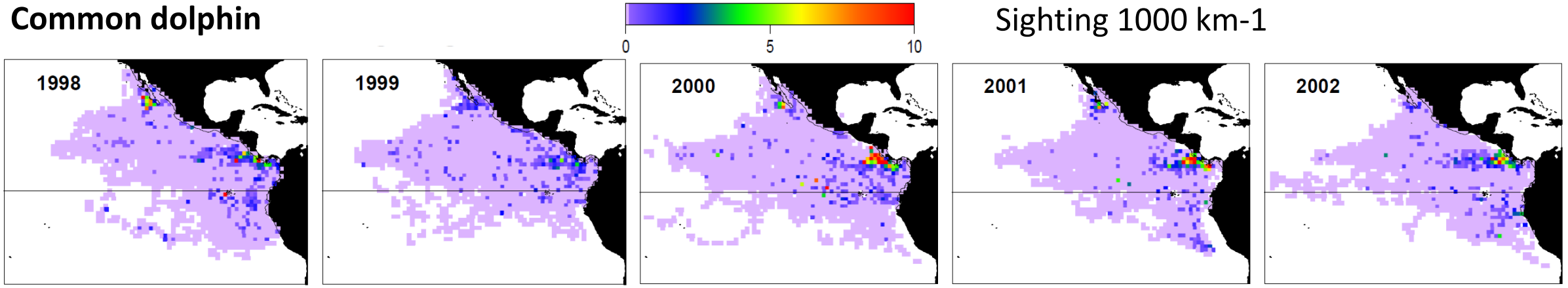

Japan and Korea show the same peaks
20
40
60
80
100
120
140
160
180
200
1980
1995
2000
JPN
KOR


JPN
KOR
Latitude
Longitude
Density
10.0
7.5
5.0
2.5

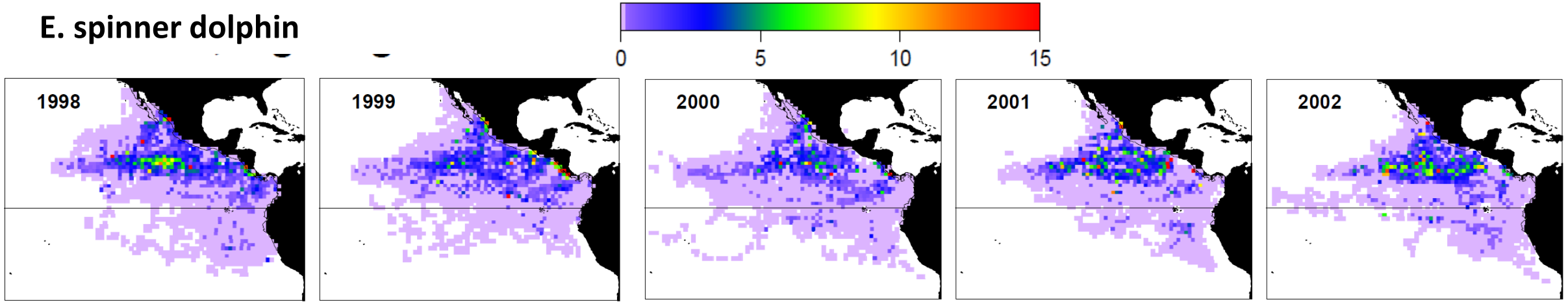
VAST indices by size class for PS and LL



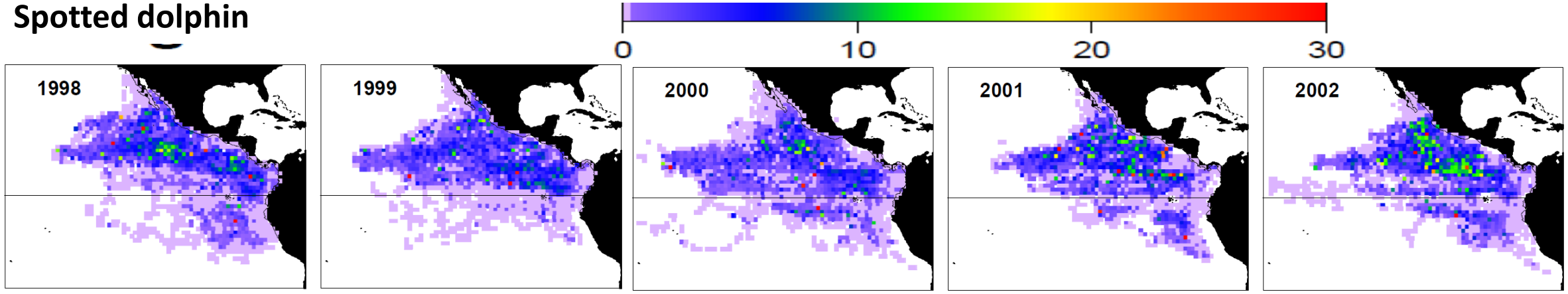
Common dolphin



E. spinner dolphin



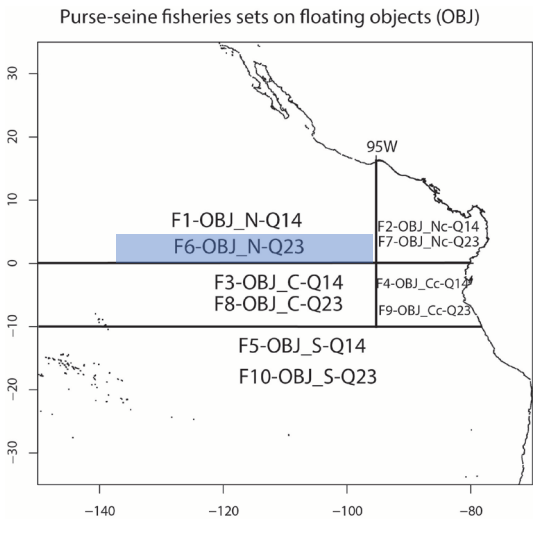
Spotted dolphin



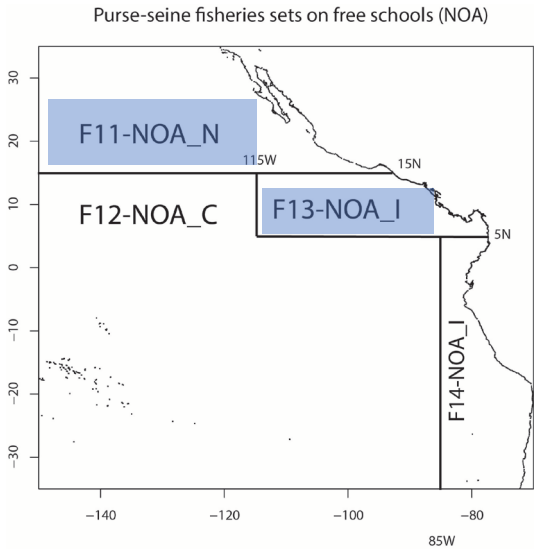
Fisheries definition of new models

Purse-seine

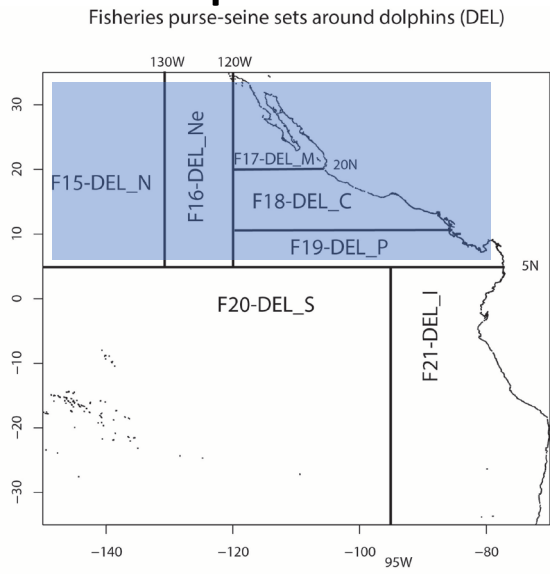
Floating objects



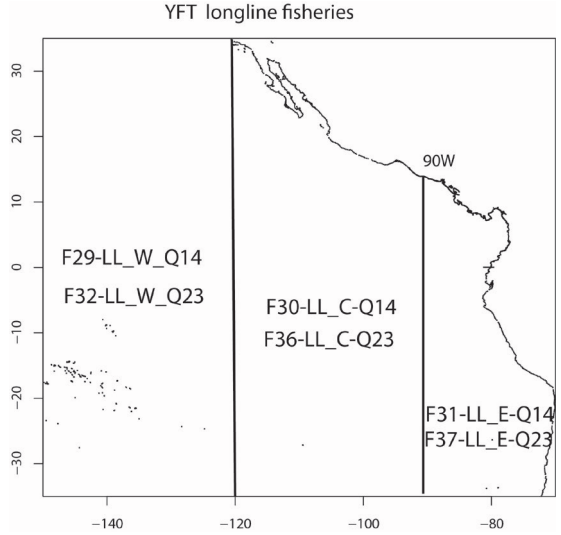
Free schools



Dolphins



Longline



North reference model

South reference model

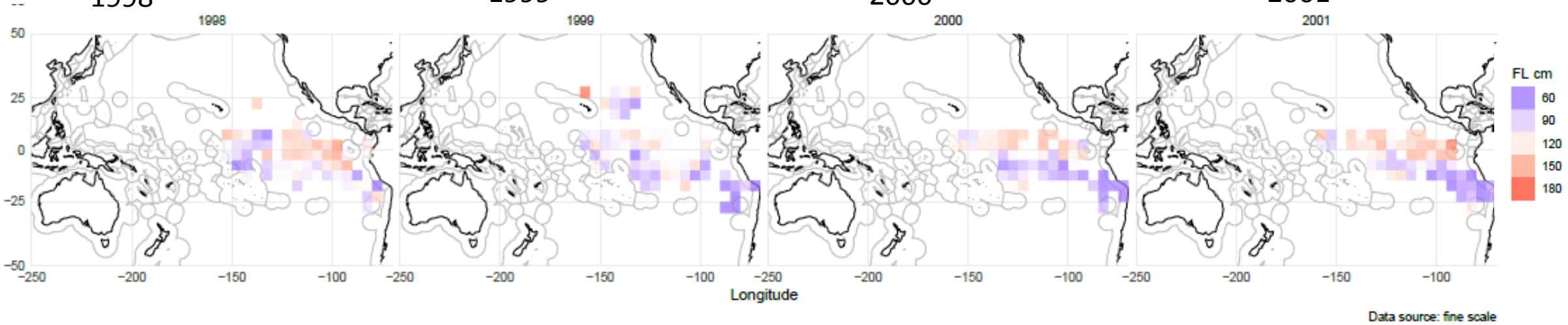
CIAT

IATTC

Thank you!

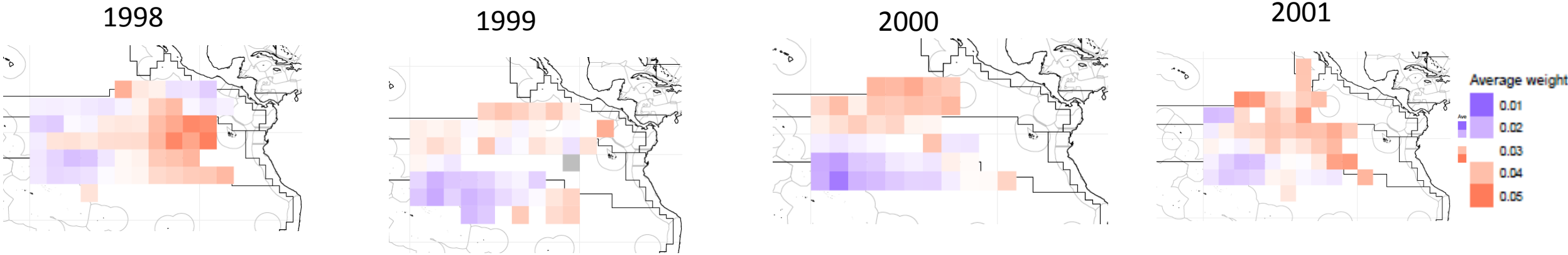
Average length YFT Japanese longline fleet

1998 1999 2000 2001

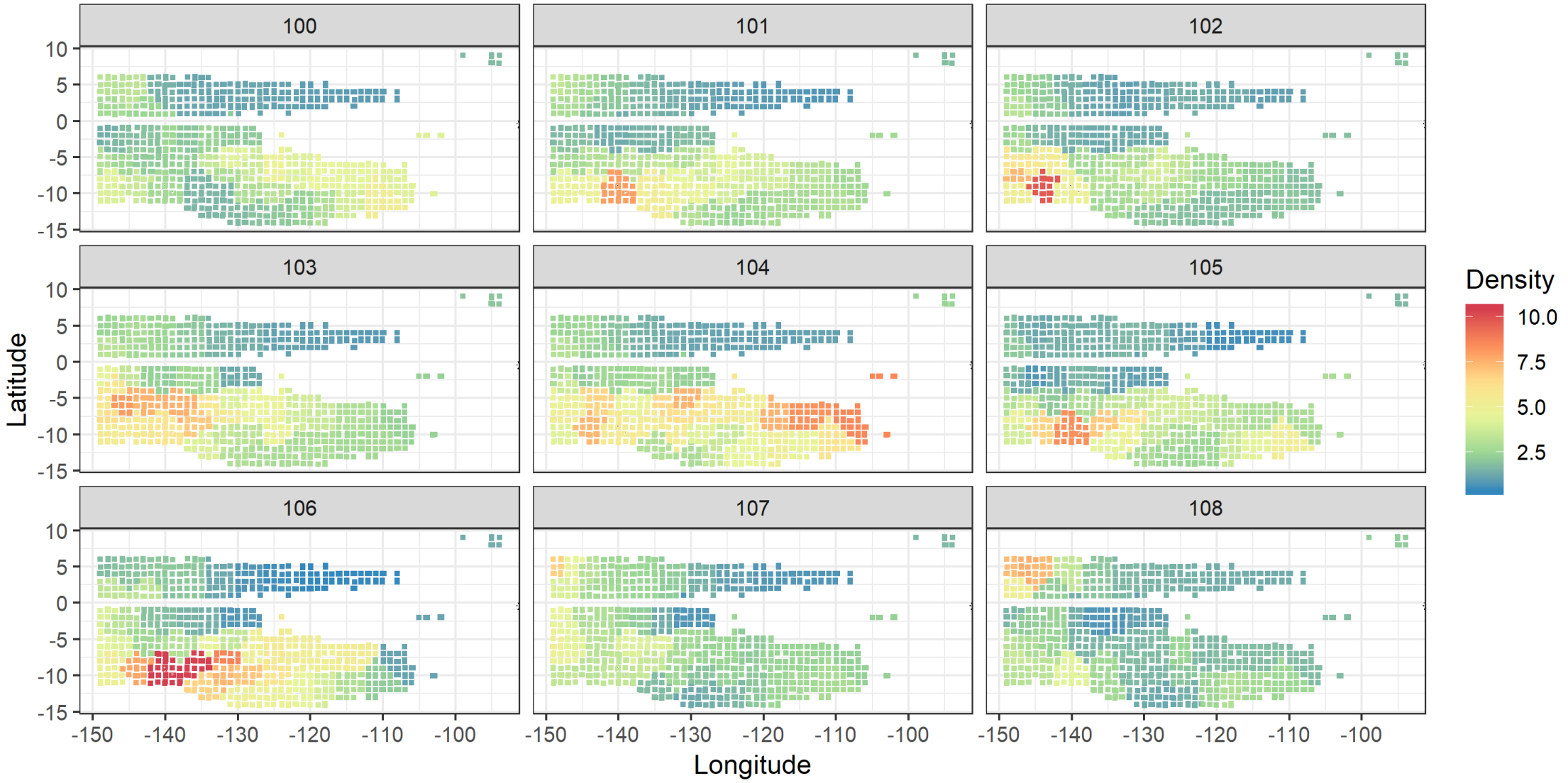


Average weight YFT Korean longline fleet

1998 1999 2000 2001



Data Source: Gridded data


100
101
102
103
104
105
106
107
108
Latitude
Longitude
10
5
0
-5
-10
-15
-150
-140
-130
-120
-110
-100
Density
10.0
7.5
5.0
2.5

Marks hypothesis:

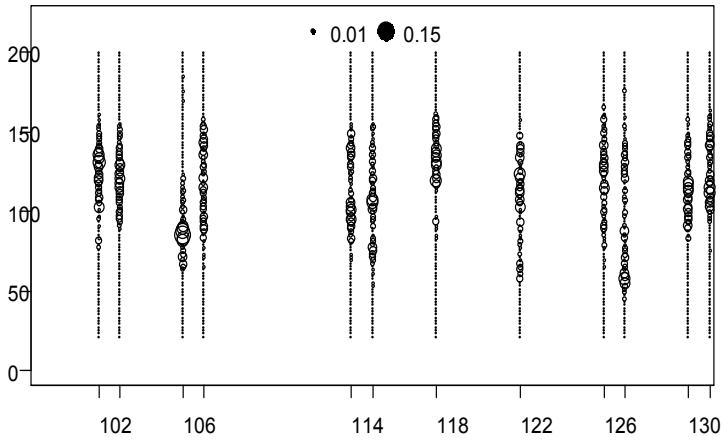
A 2.5 kg YFT is about 48cm and 1.25 years old.
A 15 kg YFT is about 90cm and 2 years old.

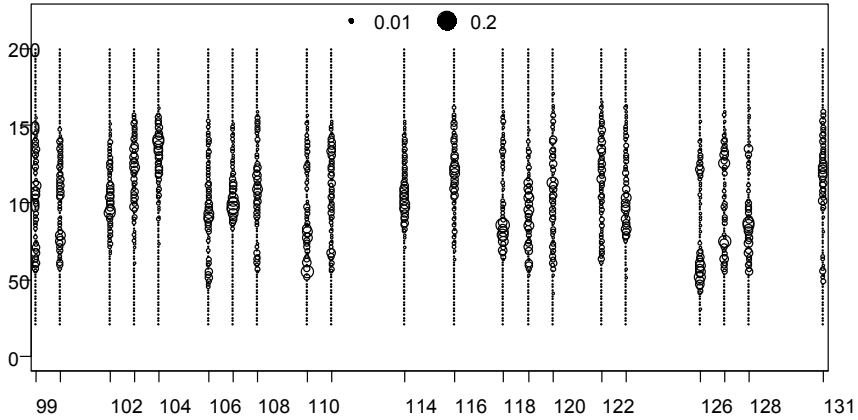
The FO fisheries catch fish that are about 35 cm or larger. 35 cm is about 0.5 years old.

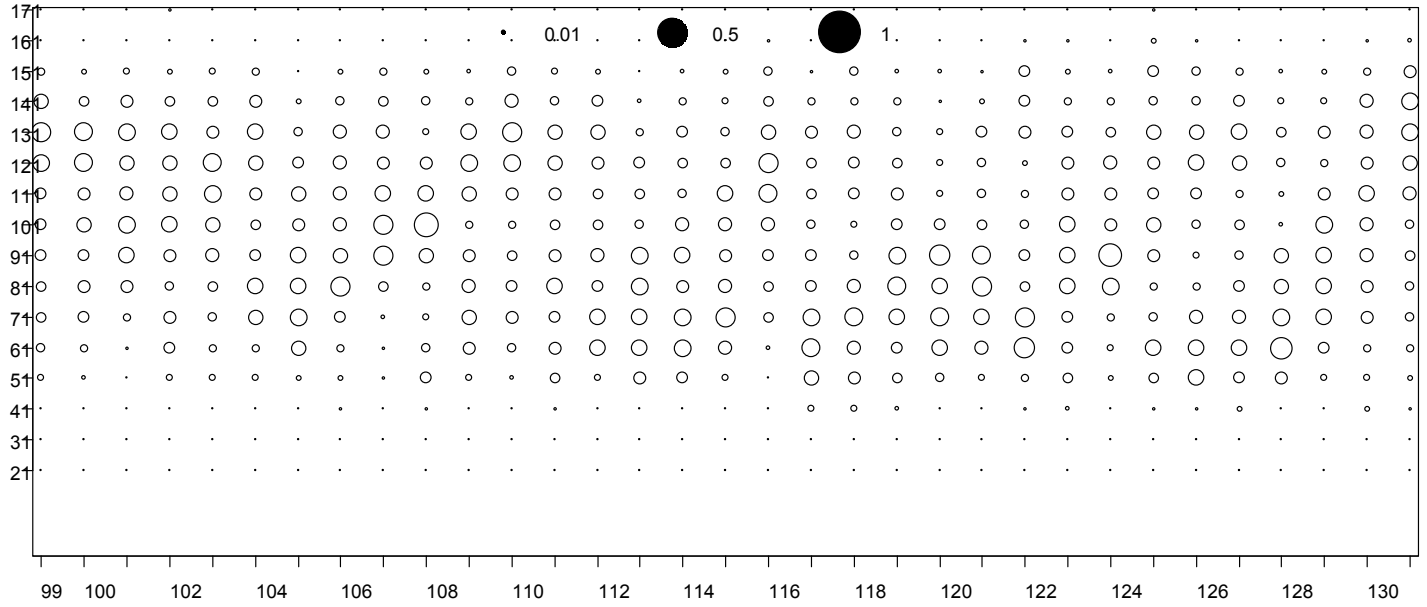
The 1998 cohort would be caught in the small category in 1998 quarter 3 through 1999 quarter 1 (1998 Q3 the cohort is 35 at the start of the quarter, 1999 Q2 is 48cm at the start of the quarter)
The 1999 cohort would be caught in the small category in 1999 quarter 3 through 2000 quarter 1 (1999 Q3 the cohort is 35 at the start of the quarter, 2000 Q2 is 48cm at the start of the quarter)

The 1998 cohort would be caught in the medium category in 1999 quarter 2 through 1999 quarter 4 (at the start or 2000 the cohort would be 90cm)
The 1999 cohort would be caught in the medium category in 2000 quarter 2 through 2000 quarter 4 (at the start or 2001 the cohort would be 90cm)

The 1998 cohort would be caught in the Large category in 2000 quarter 1 through 2000 quarter 4 (I just chose 1 year arbitrarily)
The 1999 cohort would be caught in the large category in 2001 quarter 1 through 2001 quarter 4 (I just chose 1 year arbitrarily)


0.01
0.15
200
150
100
50
0
102
106
114
118
122
126
130


0.01
0.2
200
150
100
50
0
99
102
104
106
108
110
114
116
118
120
122
126
128
131


0.01
0.5
1
171
161
151
141
131
121
111
101
91
81
71
61
51
41
31
21
99
100
102
104
106
108
110
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116
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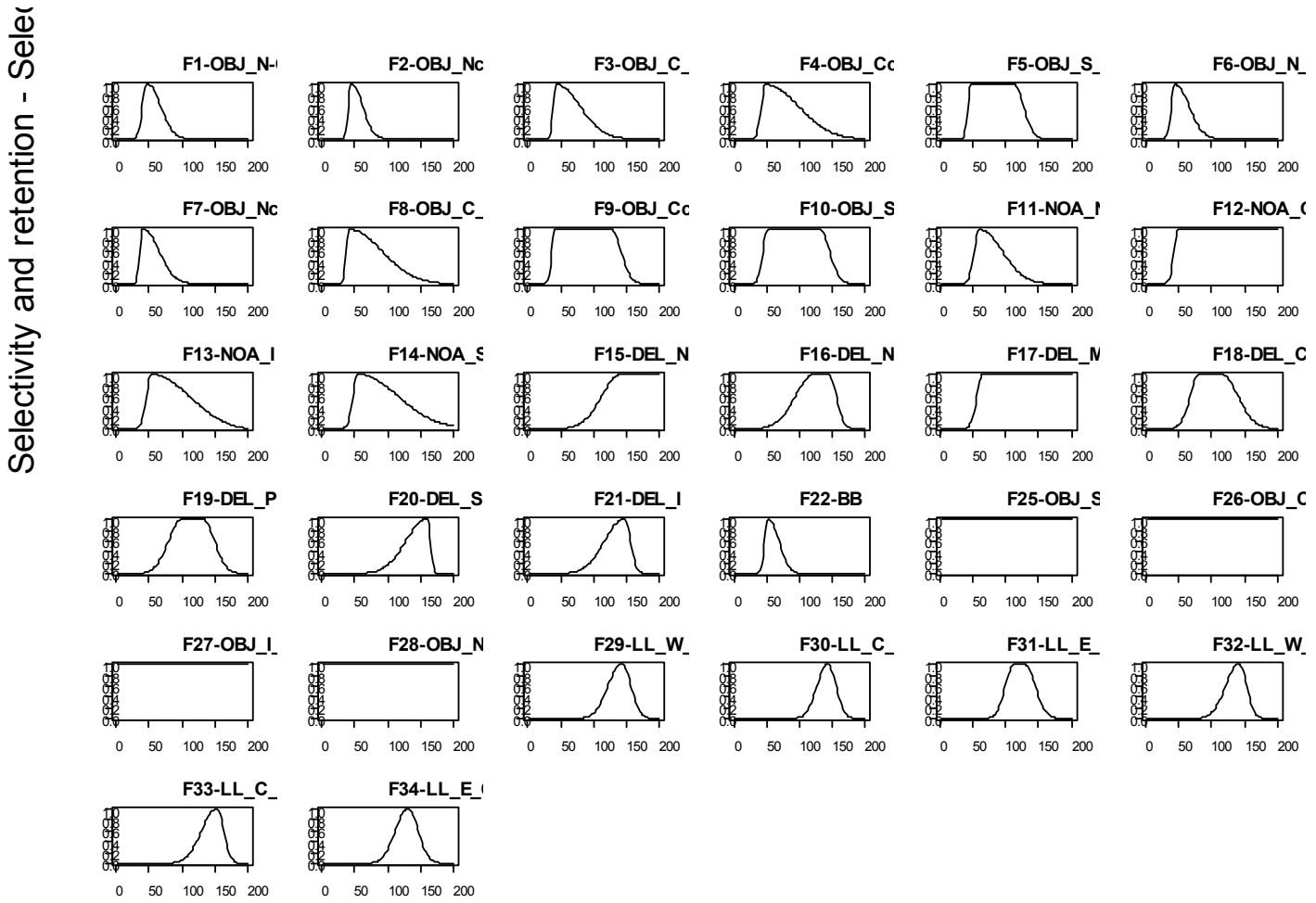
New EPO-wide model