Humpback Data Analysis

Anne Simonis

Goals of this study

Investigate the co-occurrence of humpback whales and vessel noise.

Data

Acoustic data was collected from drifting acoustic recorders during the 2018 California Current Ecosystem survey. See Simonis et al 2020 for more details. Data analyzed here includes CCES Drifts 10, 12, 13, 14, 16, 20.

Combine Logs

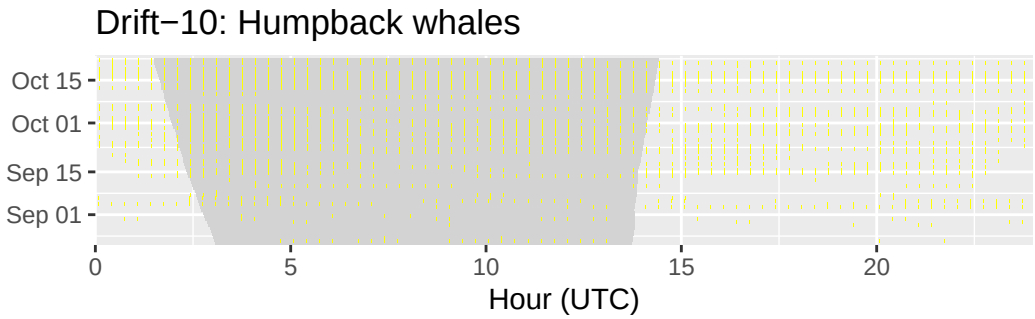
The presence of humpback whales and ships were logged by 3 Seatech analysts, including Virginia Pearson, Audrey Bahnke, and Sarah Bahnke.

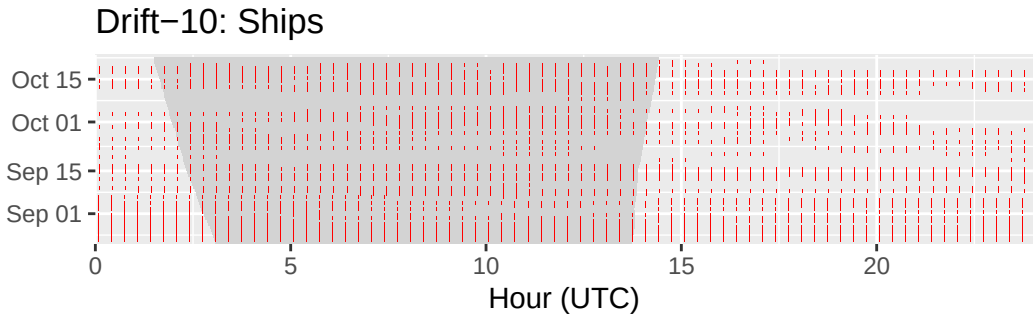
Remove times with missing data

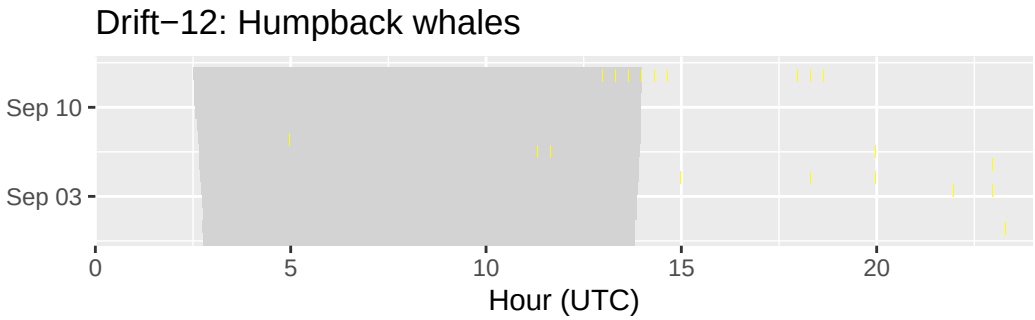
MEHS did not have audio data for the entire length of all drifts. Only show drift tracks and events from times where data was available

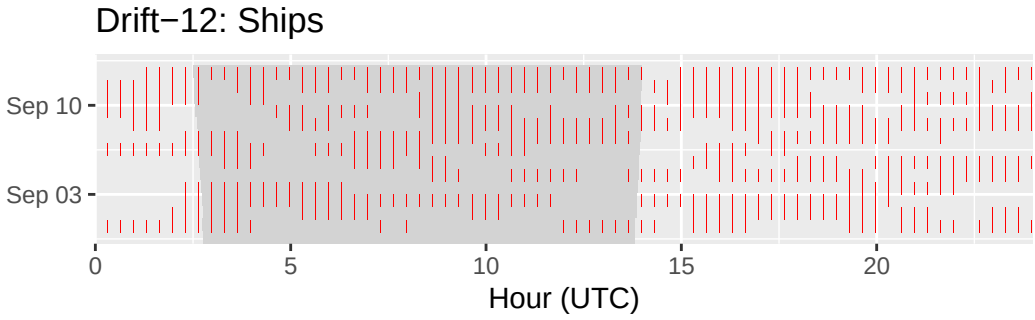
Plots

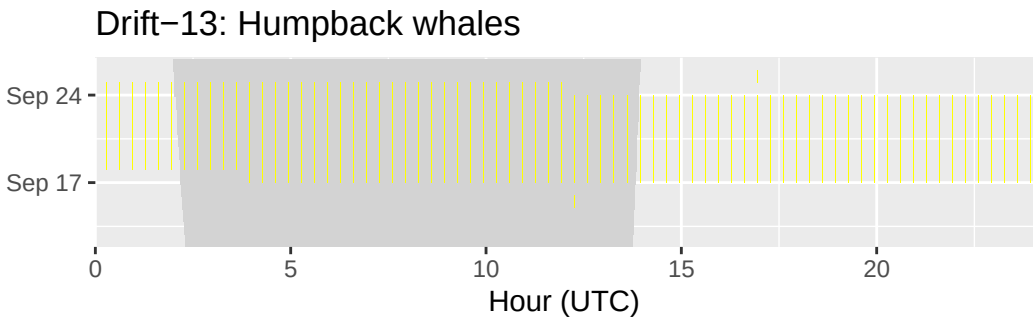
Diel Plot

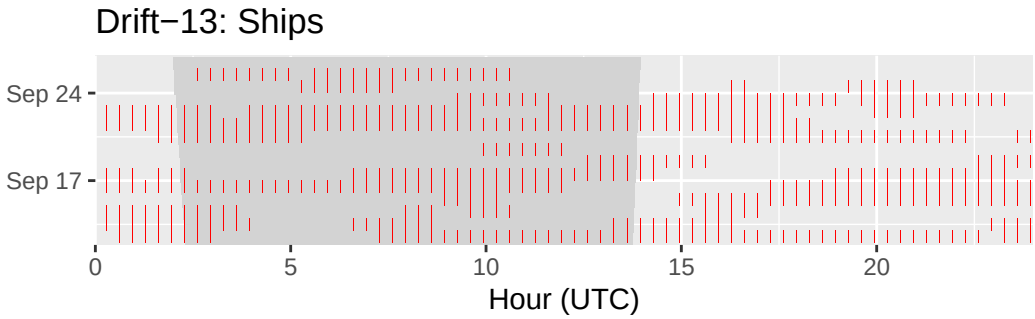


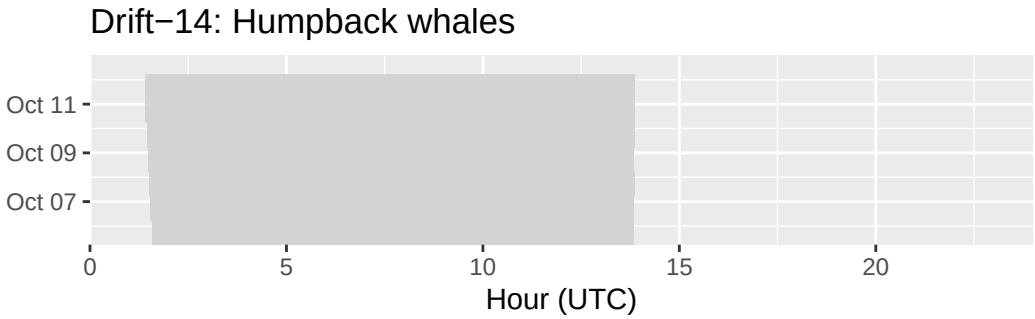


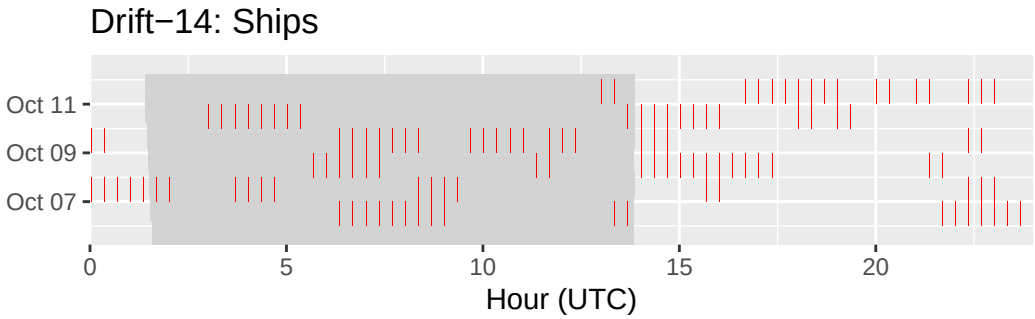


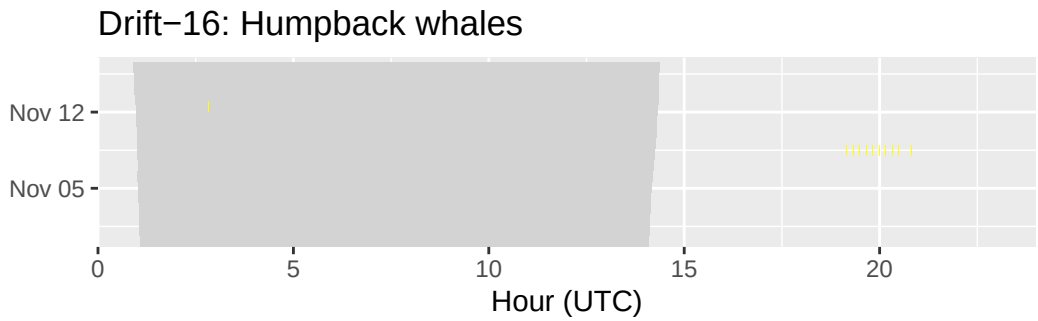


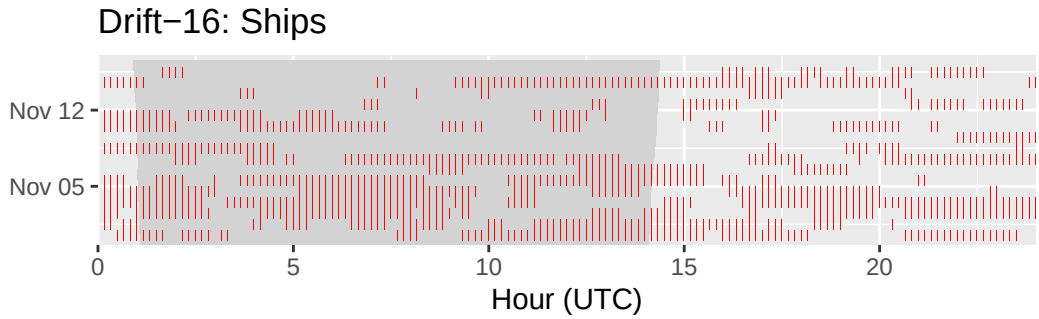

Drift−13: Humpback whales
Sep 24
Sep 17
0
5
10
15
20
Hour (UTC)

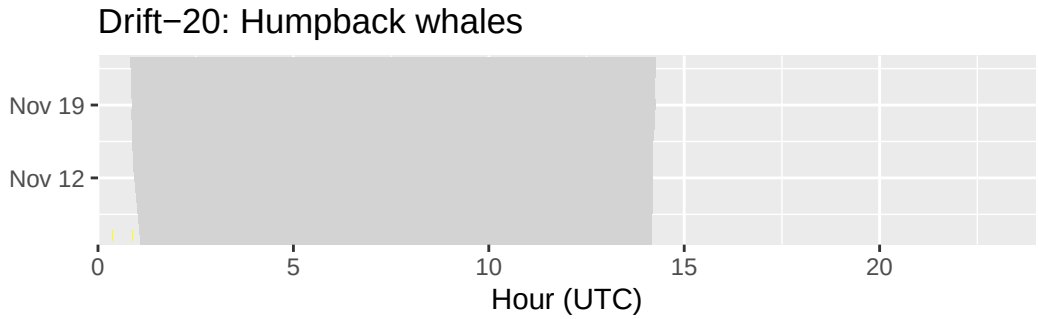

Drift−13: Ships
Sep 24
Sep 17
0
5
10
15
20
Hour (UTC)

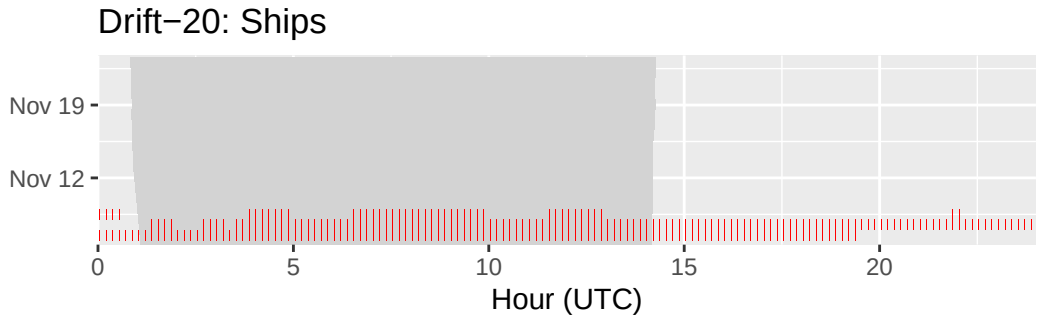

Drift−14: Humpback whales
Oct 11
Oct 09
Oct 07
0
5
10
15
20
Hour (UTC)


Drift−14: Ships
Oct 11
Oct 09
Oct 07
0
5
10
15
20
Hour (UTC)










```
[[1]]
TableGrob (2 x 1) "arrange": 2 grobs
  z     cells    name           grob
```

```
1 1 (1-1,1-1) arrange gtable[layout]
2 2 (2-2,1-1) arrange gtable[layout]

[[2]]
TableGrob (2 x 1) "arrange": 2 grobs
  z     cells    name           grob
1 1 (1-1,1-1) arrange gtable[layout]
2 2 (2-2,1-1) arrange gtable[layout]

[[3]]
TableGrob (2 x 1) "arrange": 2 grobs
  z     cells    name           grob
1 1 (1-1,1-1) arrange gtable[layout]
2 2 (2-2,1-1) arrange gtable[layout]

[[4]]
TableGrob (2 x 1) "arrange": 2 grobs
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1 1 (1-1,1-1) arrange gtable[layout]
2 2 (2-2,1-1) arrange gtable[layout]

[[5]]
TableGrob (2 x 1) "arrange": 2 grobs
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1 1 (1-1,1-1) arrange gtable[layout]
2 2 (2-2,1-1) arrange gtable[layout]

[[6]]
TableGrob (2 x 1) "arrange": 2 grobs
  z     cells    name           grob
1 1 (1-1,1-1) arrange gtable[layout]
2 2 (2-2,1-1) arrange gtable[layout]
```
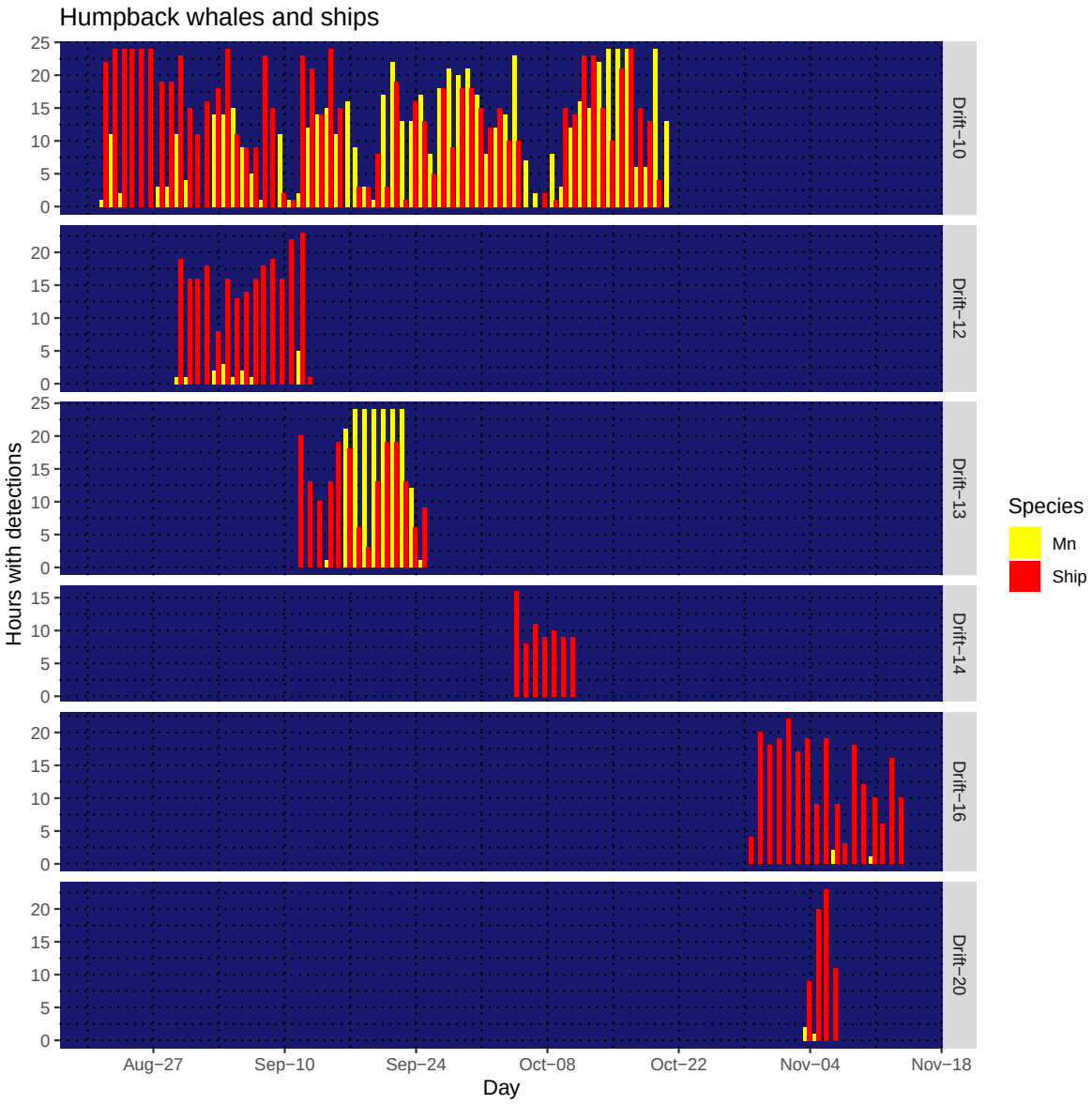
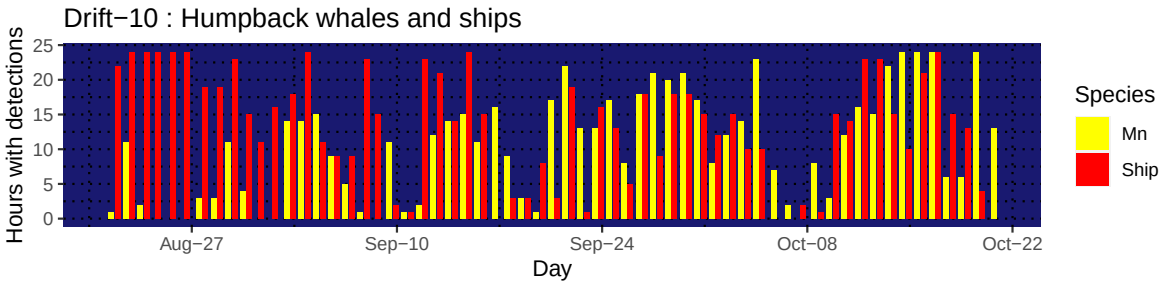
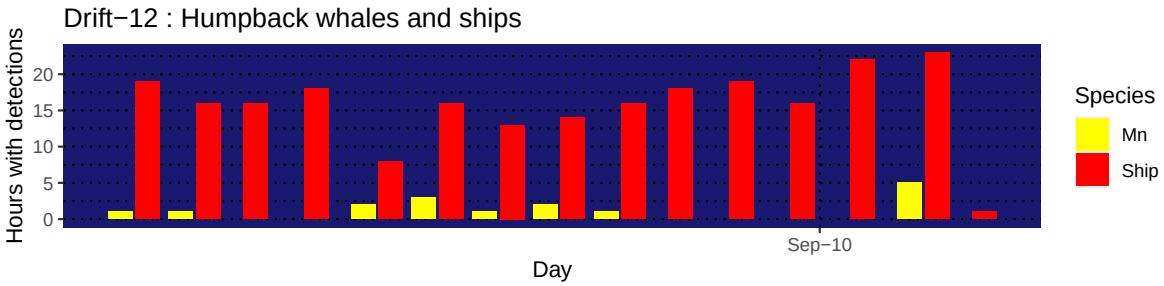
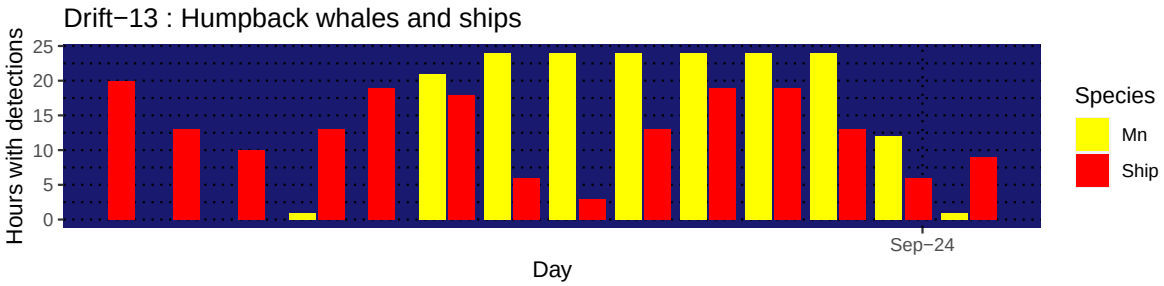
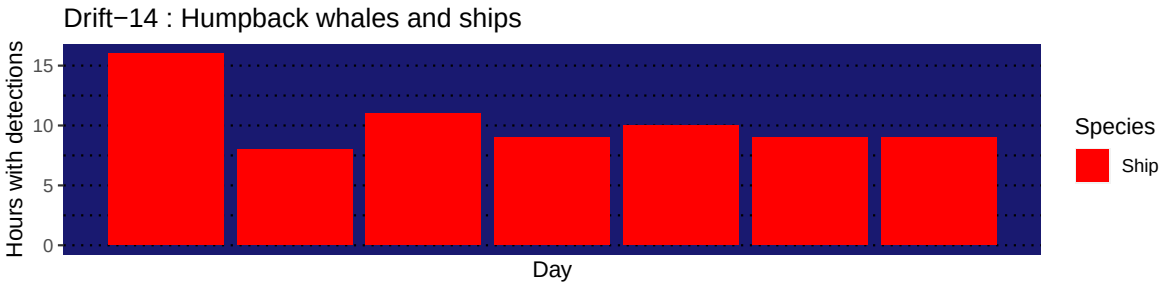

Daily Plot (# of hours with detections each day)

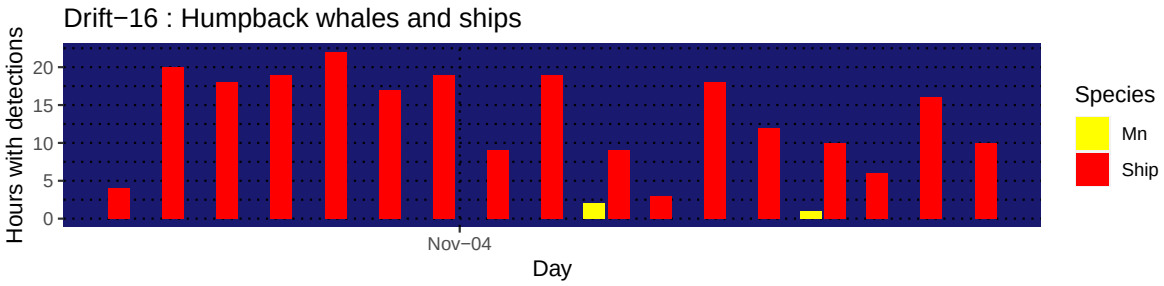


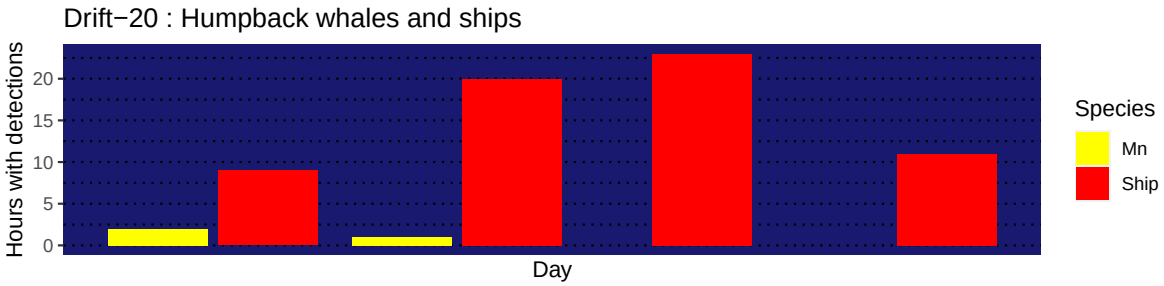

Drift−10 : Humpback whales and ships
Hours with detections
25
20
15
10
5
0
Aug−27
Sep−10
Sep−24
Oct−08
Oct−22
Day
Species
Mn
Ship


Drift−12 : Humpback whales and ships
Hours with detections
20
15
10
5
0
Sep−10
Day
Species
Mn
Ship


Drift−13 : Humpback whales and ships
Hours with detections
25
20
15
10
5
0
Sep−24
Day
Species
Mn
Ship

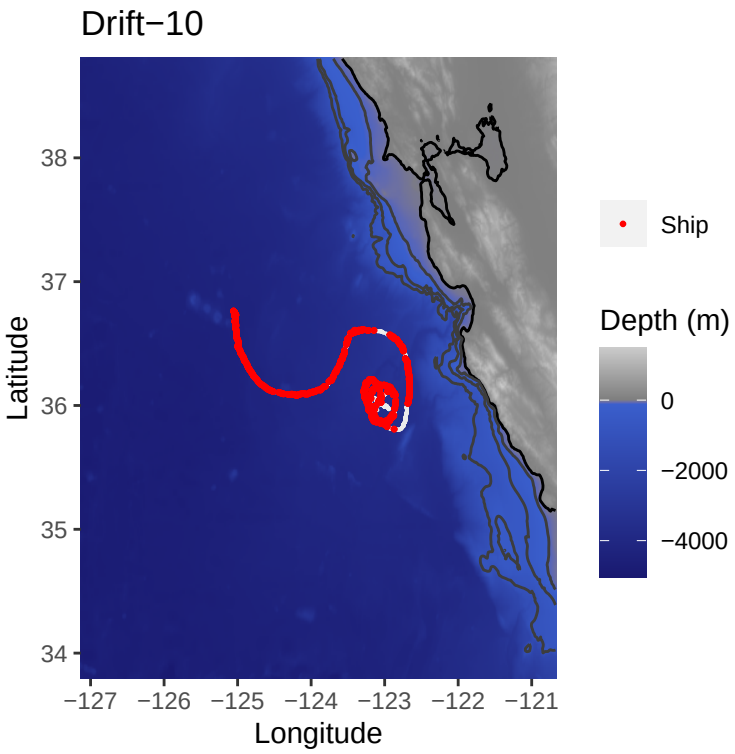

Drift−14 : Humpback whales and ships
Hours with detections
15
10
5
0
Day
Species
Ship

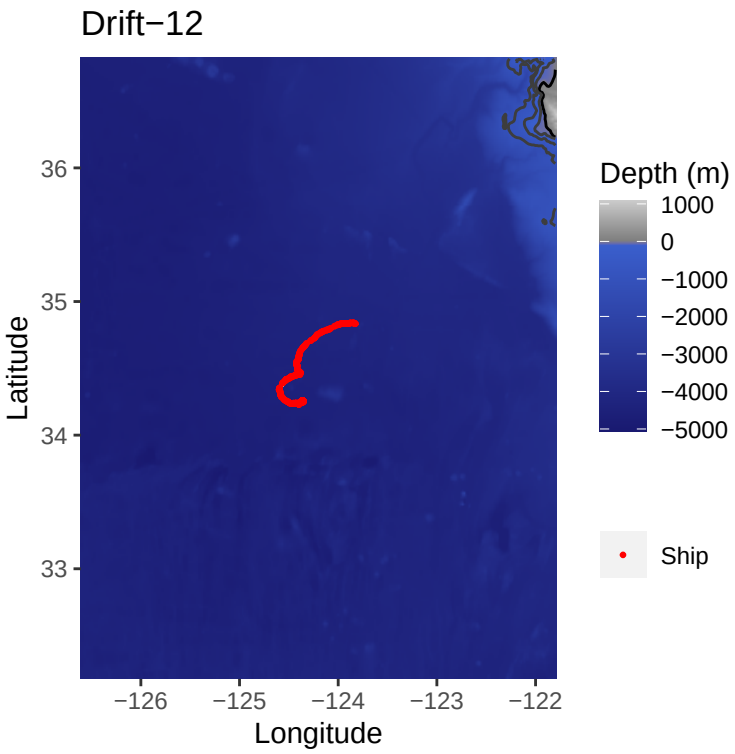


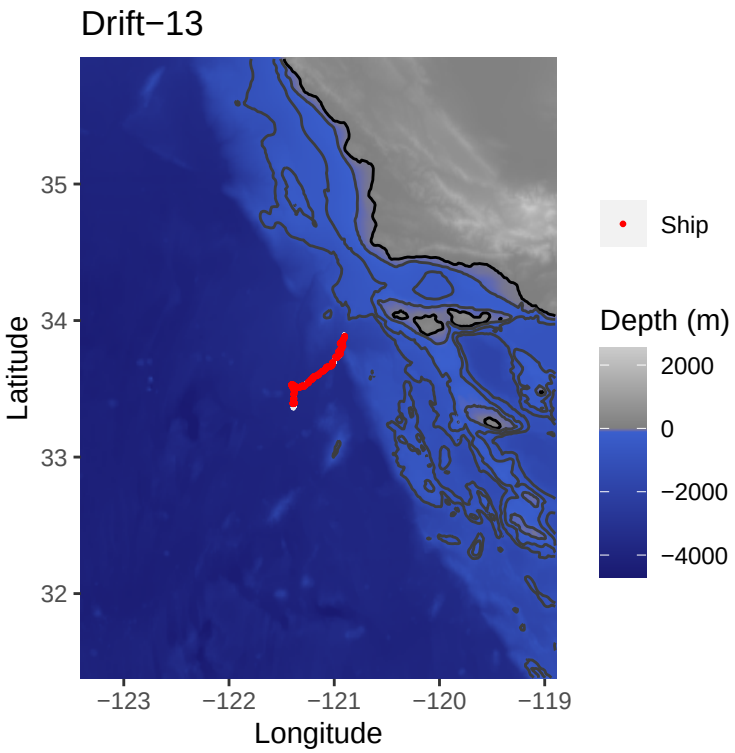


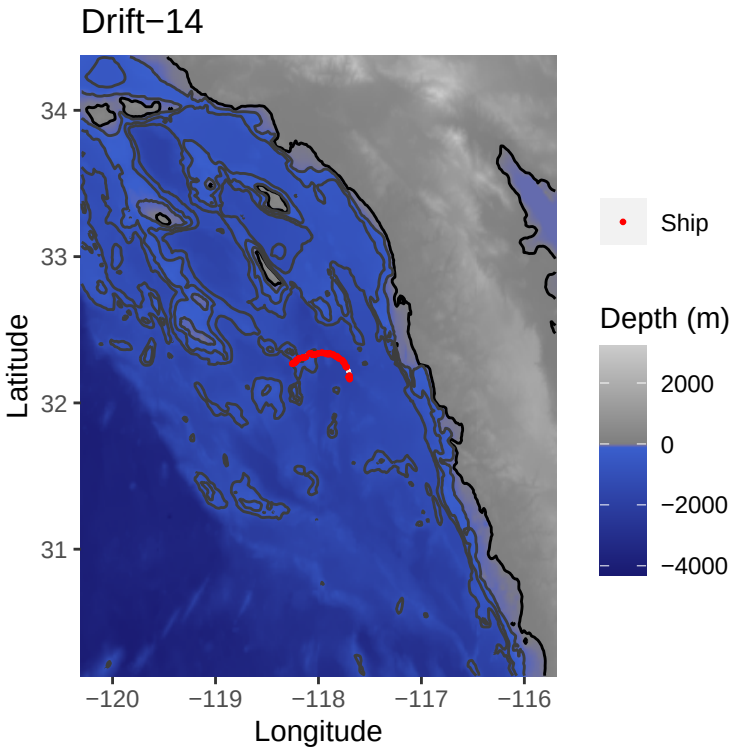
Map

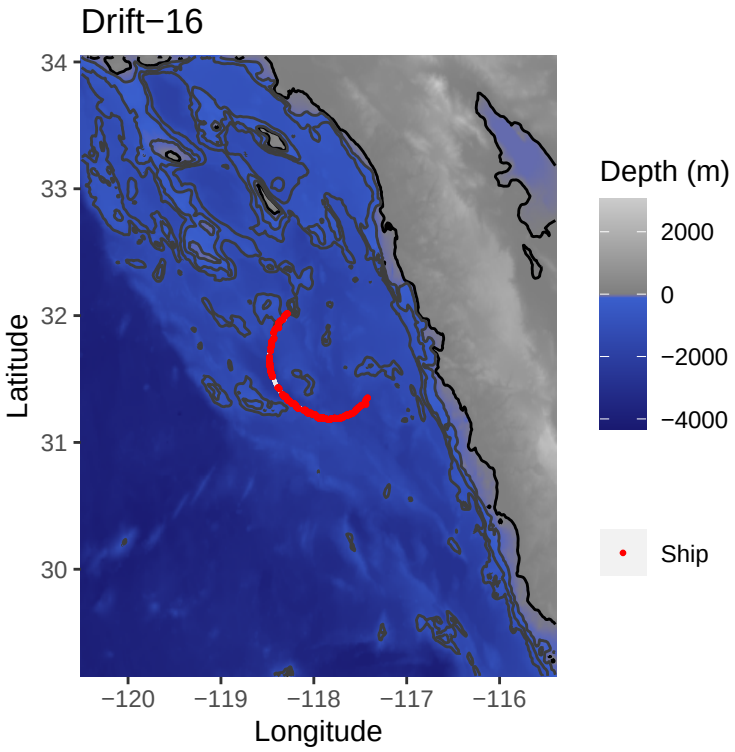
Ship Maps

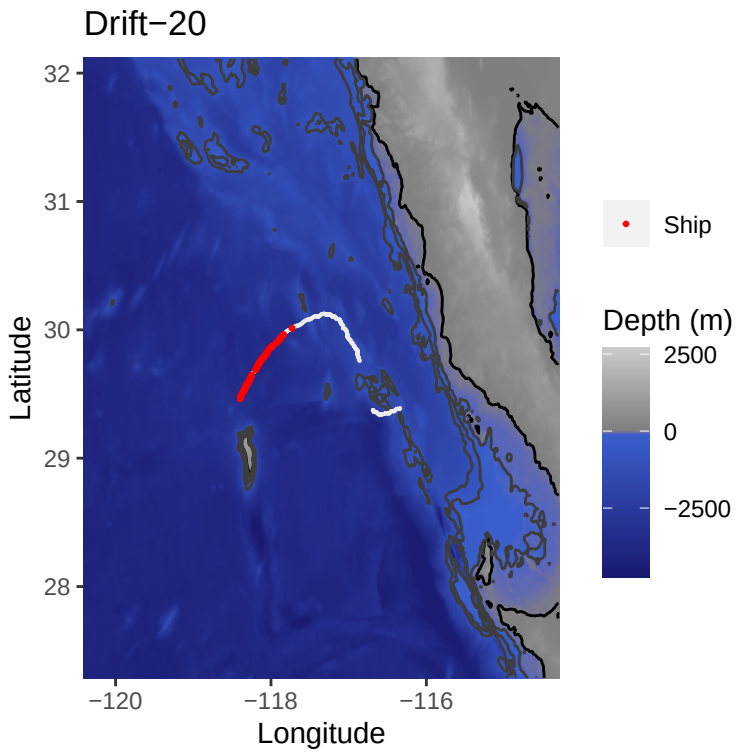

Drift−10
38
37
36
35
34
Latitude
−127
−126
−125
−124
−123
−122
−121
Longitude
Ship
Depth (m)
0
−2000
−4000


Drift−12
36
35
34
33
Latitude
−126
−125
−124
−123
−122
Longitude
Depth (m)
1000
0
−1000
−2000
−3000
−4000
−5000
Ship

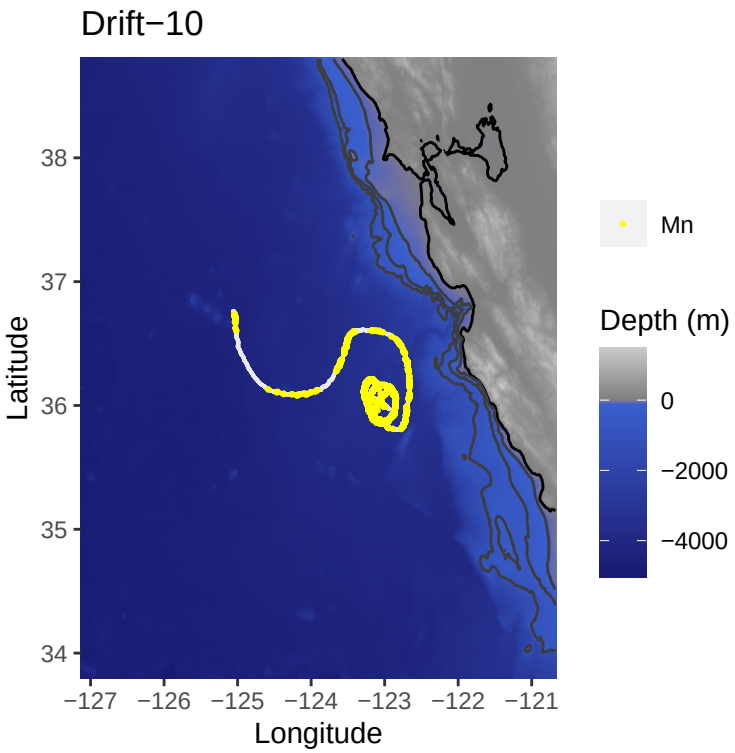

Drift−13
Latitude
35
34
33
32
−123
−122
−121
−120
−119
Longitude
Ship
Depth (m)
2000
0
−2000
−4000

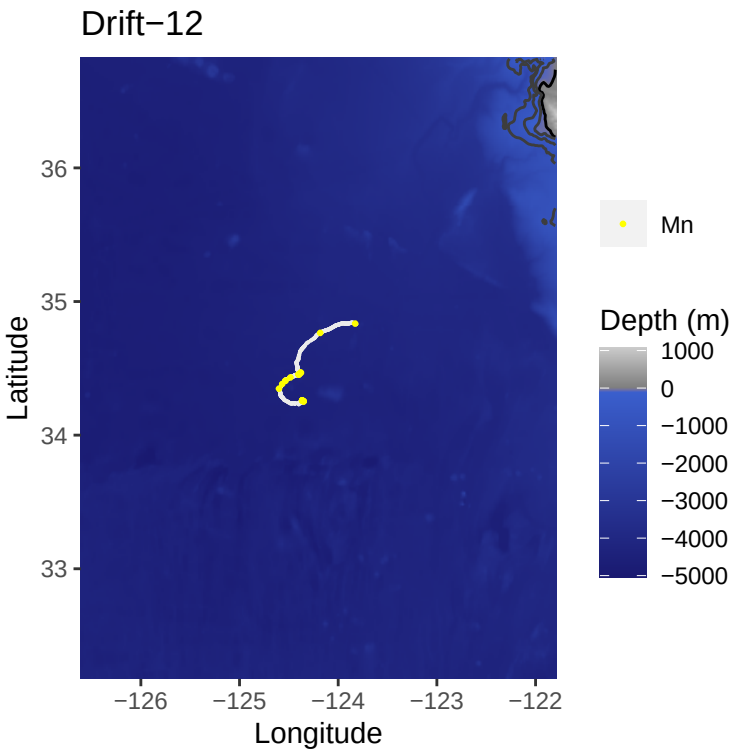

Drift−14
34
33
32
31
Latitude
−120
−119
−118
−117
−116
Longitude
Ship
Depth (m)
2000
0
−2000
−4000

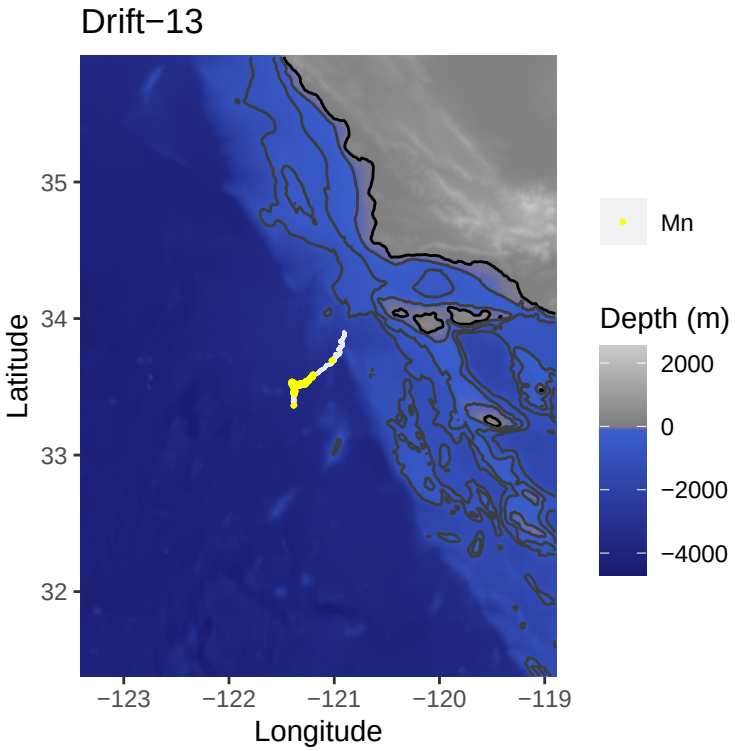

Drift−16
34
33
32
31
30
Latitude
−120
−119
−118
−117
−116
Longitude
Depth (m)
2000
0
−2000
−4000
Ship

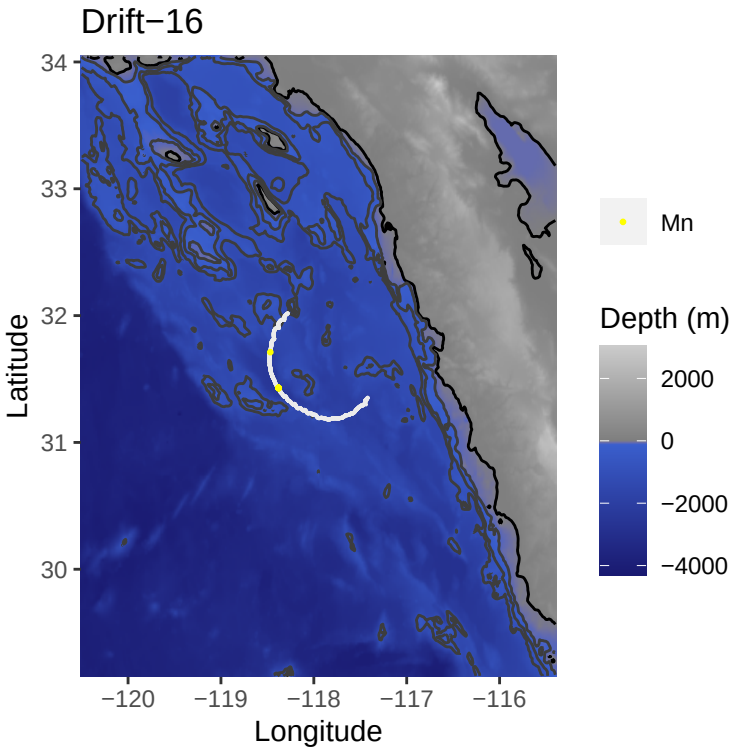


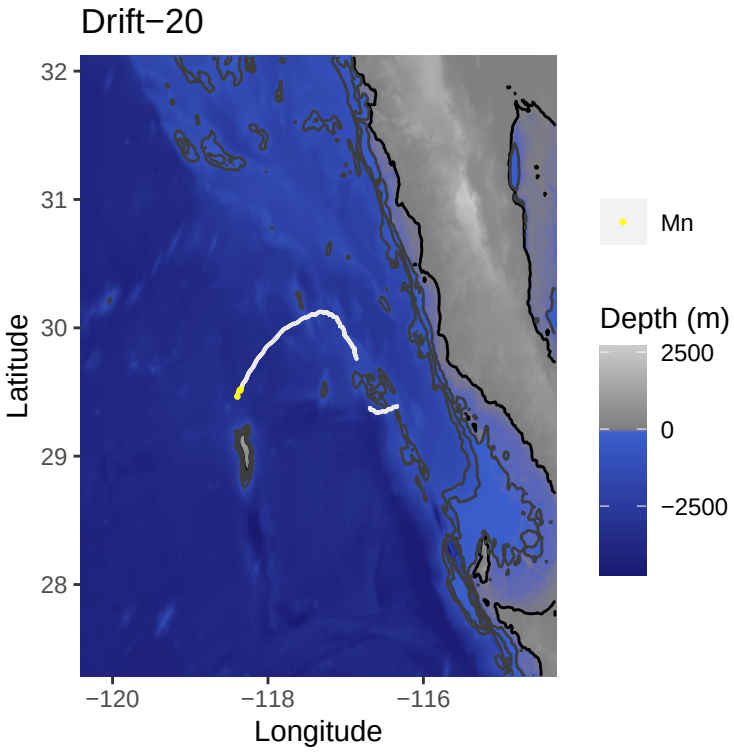
Humpback Maps


Drift−10
38
37
36
35
34
Latitude
−127
−126
−125
−124
−123
−122
−121
Longitude
Mn
Depth (m)
0
−2000
−4000

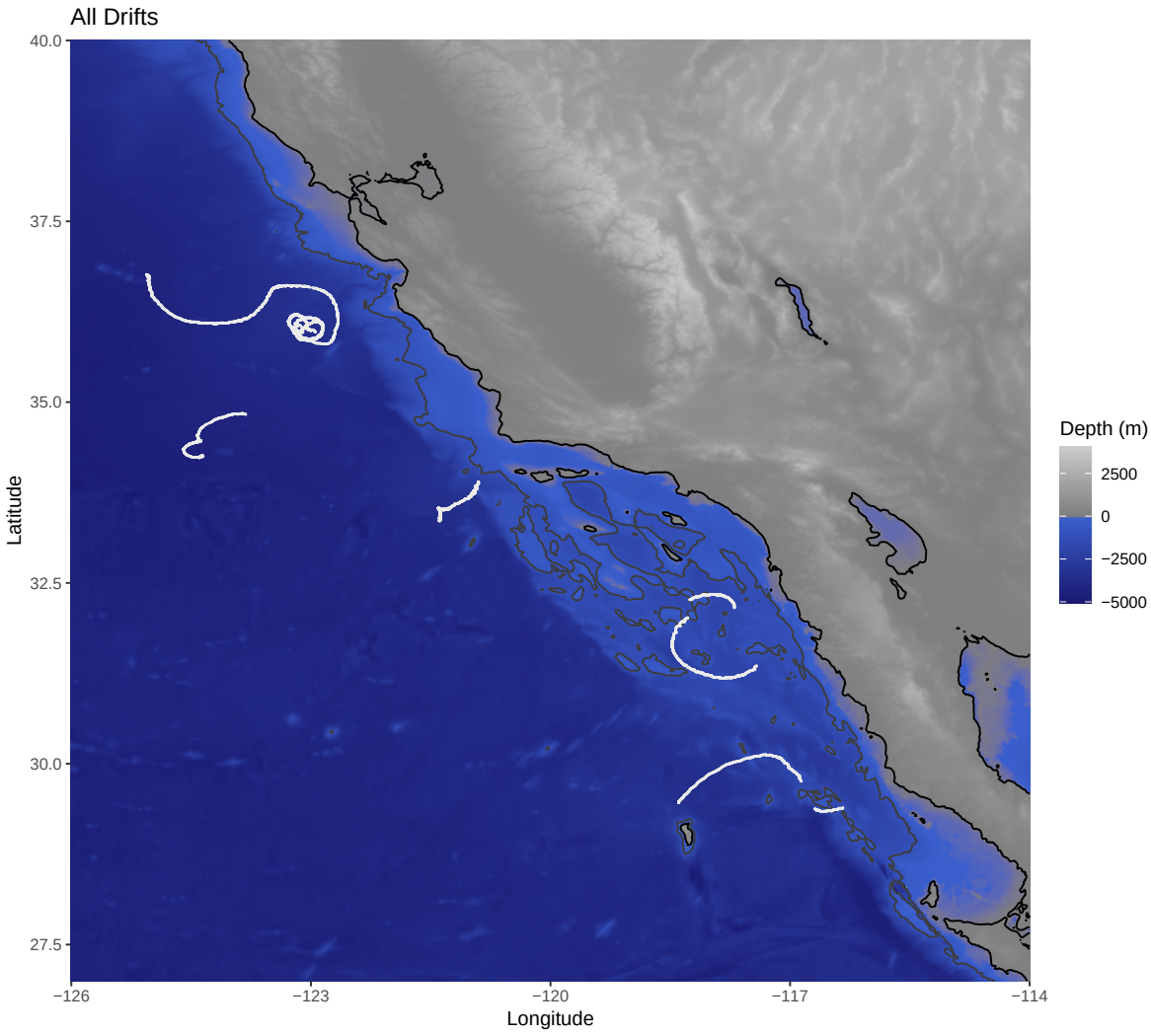

Drift−12
36
35
34
33
Latitude
−126
−125
−124
−123
−122
Longitude
Mn
Depth (m)
1000
0
−1000
−2000
−3000
−4000
−5000

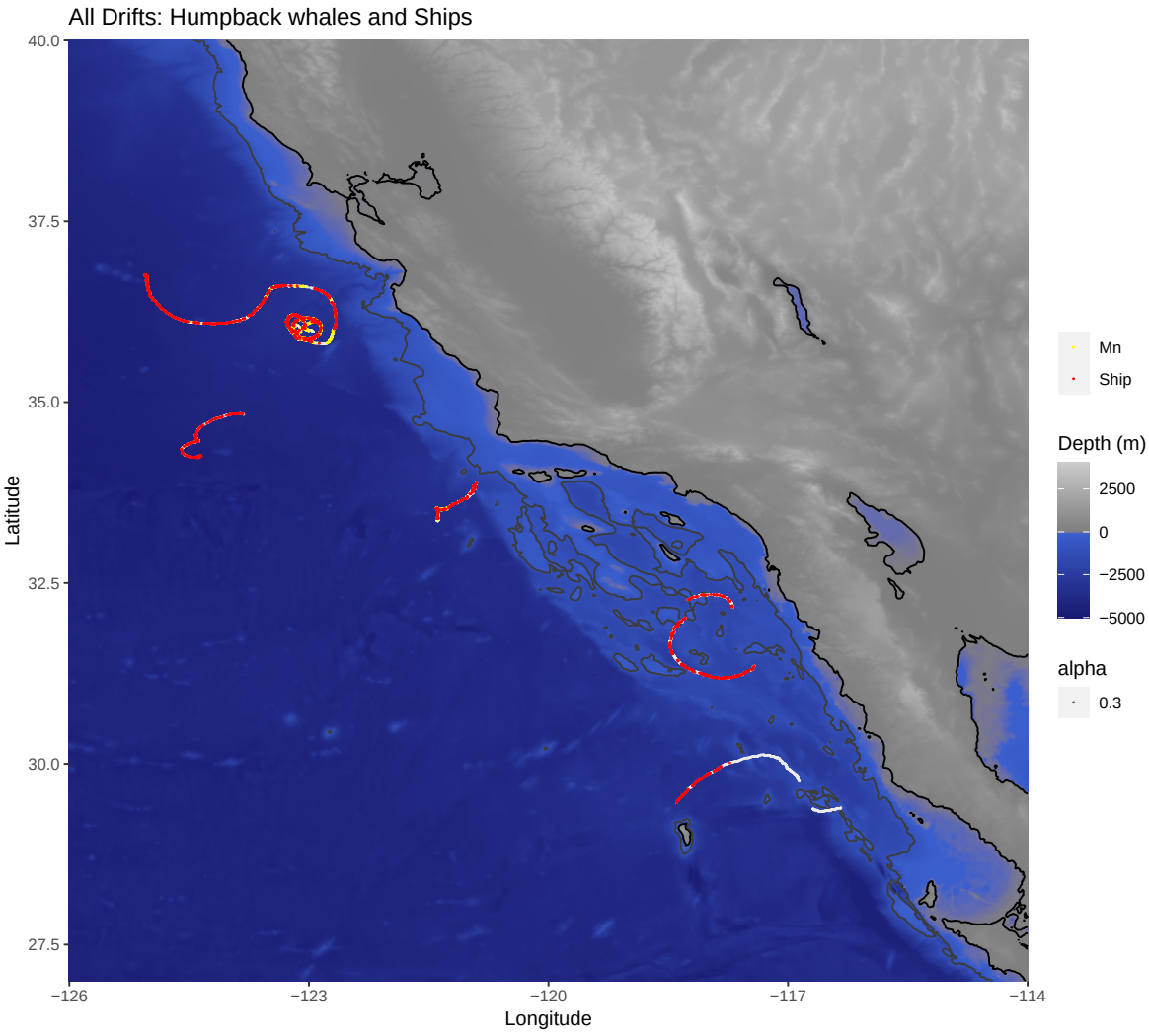

Drift−13
Latitude
35
34
33
32
−123
−122
−121
−120
−119
Longitude
Mn
Depth (m)
2000
0
−2000
−4000


Drift−16
34
33
32
31
30
Latitude
−120
−119
−118
−117
−116
Longitude
Mn
Depth (m)
2000
0
−2000
−4000

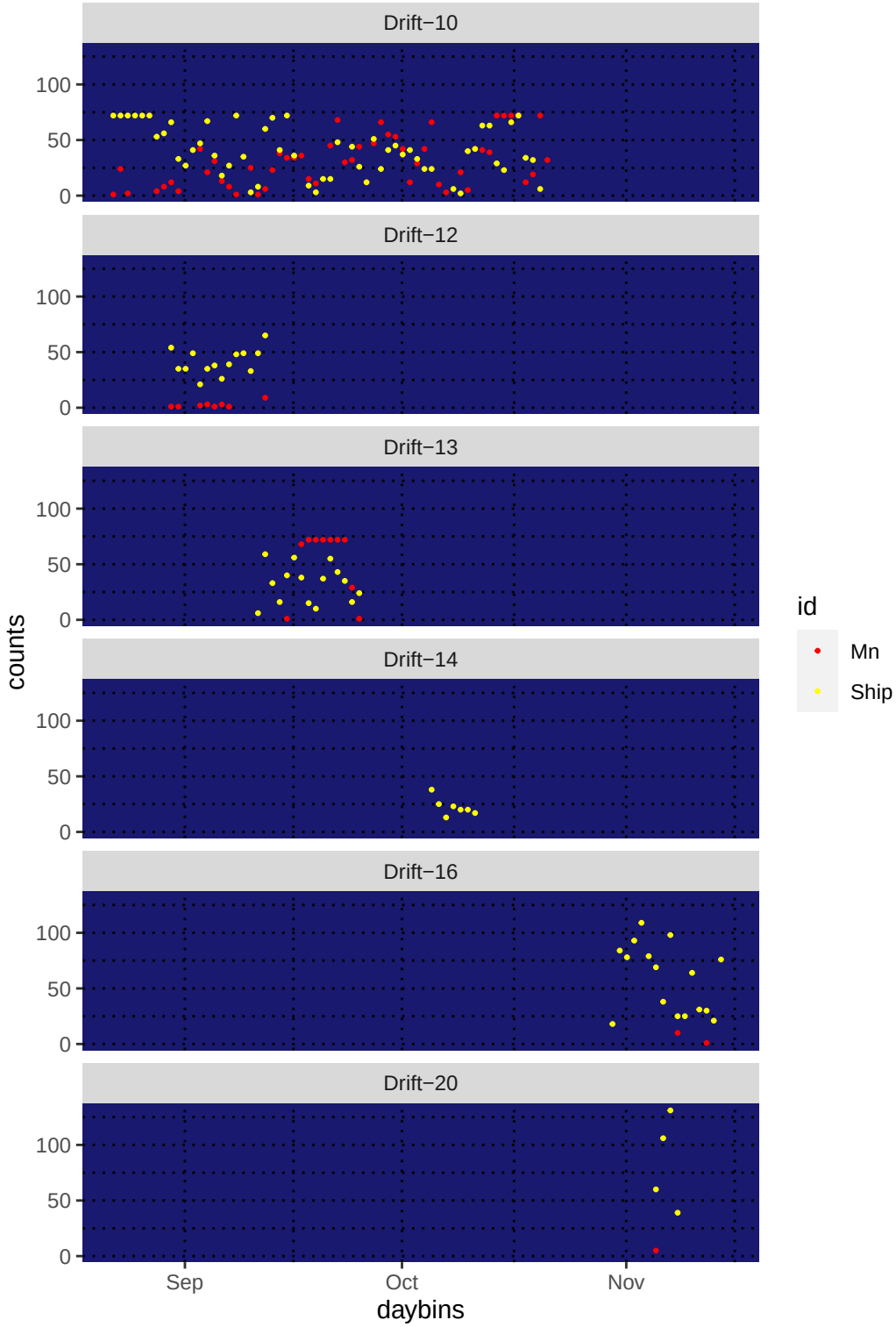


Map of all drifts


All Drifts
40.0
37.5
35.0
32.5
30.0
27.5
Latitude
−126
−123
−120
−117
−114
Longitude
Depth (m)
2500
0
−2500
−5000


All Drifts: Humpback whales and Ships
40.0
37.5
35.0
32.5
30.0
27.5
Latitude
−126
−123
−120
−117
−114
Longitude
Mn
Ship
Depth (m)
2500
0
−2500
−5000
alpha
0.3

All-drift Timeseries



the end!