## Sampling summary

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The six vessels covered four different areas between 2017-08-15 and the 2017-09-13 (Figure 3.1), making a total of 84 sampled hauls, of which 21 were taken in survey mode and the rest during commercial fisheries.

Within area 6a, herring were caught and sampled during 35 hauls, resulting in biological information collected from a total of 1813 herring (Table 3.1). In addition 2 hauls of herring in the adjacent North Sea are were sampled and biological information was collected from 76 individual herring. Details on the sampling per trip are shown in Table 3.2 and for spawning herring in Table 3.3. Details on the number of measurement per trip and haul are shown in Table 3.4.

Most of the spawning herring were found in area 3, west of the mainland. Almost no herring were observed in Area 1 (pre-spawning mixing area). No spawning herring were found in the Outer Hebrides (Figure 3.2).

Length distributions of herring were largely similar by survey area and by haul (Figure 3.3, 3.4).

Because many of the samples have been taken in survey area 3, it is possible to focus on the time development in maturity of herring in that area. All maturity data were converted into a common six point scale, in which stage 1 is immature, stage 2 is ripening, stage 3 is spawning and stage 4 is spent or resting. Spawning started on September 1st and that there was still a large amount of spawning activity by the end of the survey on September 12th (Figure 3.5).

[This needs to come from Benoit]

Maps of the survey tracks, relative acoustic density, and locations of hauls whose biological data was used in for the estimation of the biomass of herring in 6aN are shown in Figure 3.5, Table 3.2.

typehaul variable ALL\_haul ALL\_fish SPAWNING\_haul SPAWNING\_fish   
---------- --------------- ---------- ---------- --------------- ---------------  
C all 44 979 18 631   
C genetics 16 366 8 302   
C morphometrics 2 120 1 117   
S all 20 910 5 25   
S genetics 7 453 3 23   
S morphometrics 7 453 3 23

*Table 3.1: overview of number of hauls and number of herring collected during commercial fishing operation (C) or survey operations (S) and for which either morphometric or genetic samples have been collected. Either all observations or for spawning herring only.*

vessel name trip type begin end nhaul nlen nwght nage nsex nmat nphoto ngen   
-------- ----------- -------- ------ ------------ ------------ ------- ------ ------- ------ ------ ------ -------- ------  
FR487 Sunbeam SB0117 S 2017-08-22 2017-08-26 3 233 102 95 102 102 0 0   
FR487 Sunbeam SB0217 C 2017-09-04 2017-09-05 2 293 66 0 66 66 0 39   
FR487 Sunbeam SB0317 C 2017-09-07 2017-09-08 3 355 90 0 90 90 0 77   
FR487 Sunbeam SB0417 C 2017-09-11 2017-09-12 3 349 113 0 113 113 0 113   
KW172 Dirk Dirk DD0717 C 2017-08-15 2017-08-19 9 . . . . . . .   
KW172 Dirk Dirk DD0817 C 2017-09-02 2017-09-13 31 2315 . . . . . .   
KW172 Dirk Dirk DD0817 S 2017-08-29 2017-08-31 4 424 230 227 230 230 213 213   
LK419 Antares AT0917 S 2017-09-05 2017-09-08 4 1053 334 0 334 334 240 240   
LK419 Antares AT1017 C 2017-09-09 2017-09-09 2 389 131 0 131 131 120 120   
PD265 Lunar bow LB0117 C 2017-09-06 2017-09-06 4 574 250 182 250 250 0 17   
PD265 Lunar bow LB0117 S 2017-08-28 2017-09-04 8 540 218 212 218 218 0 0   
PH2200 Wiron 6 W61017 C 2017-08-30 2017-09-08 9 1453 328 125 125 125 0 0   
PH2200 Wiron 6 W61017 S 2017-09-02 2017-09-06 2 177 26 0 0 0 0 0

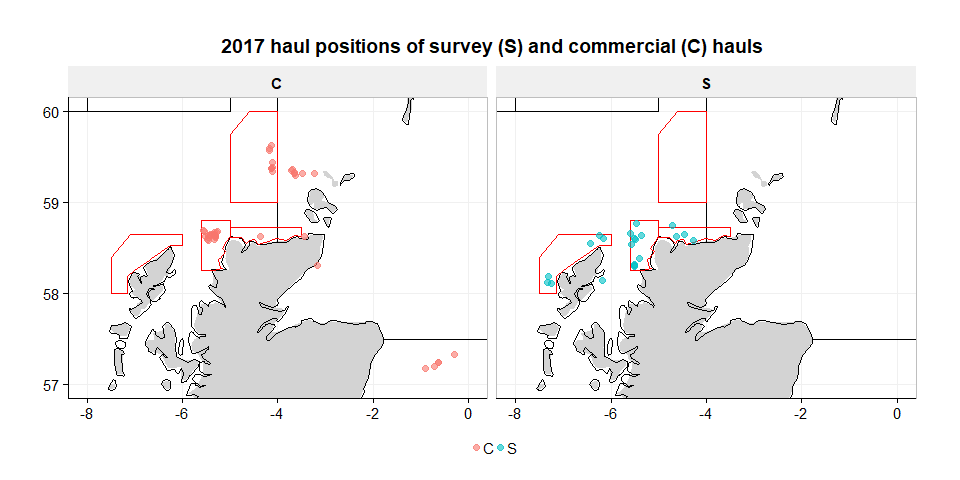
*Table 3.2: overview of trip properties. 'Type' refers to the type of activity (S=survey, C=commercial). The variables starting with 'n' denote the number of fish measured for the specific variable.*

vessel name trip type nlen nwght nage nsex nphoto ngen   
-------- ----------- -------- ------ ------ ------- ------ ------ -------- ------  
FR487 Sunbeam SB0217 C 32 32 0 32 0 15   
FR487 Sunbeam SB0317 C 76 76 0 76 0 71   
FR487 Sunbeam SB0417 C 85 85 0 85 0 85   
KW172 Dirk Dirk DD0817 S 1 1 1 1 1 1   
LK419 Antares AT0917 S 22 22 0 22 22 22   
LK419 Antares AT1017 C 127 127 0 127 117 117   
PD265 Lunar bow LB0117 C 218 218 163 218 0 14   
PD265 Lunar bow LB0117 S 2 2 2 2 0 0   
PH2200 Wiron 6 W61017 C 93 93 93 93 0 0

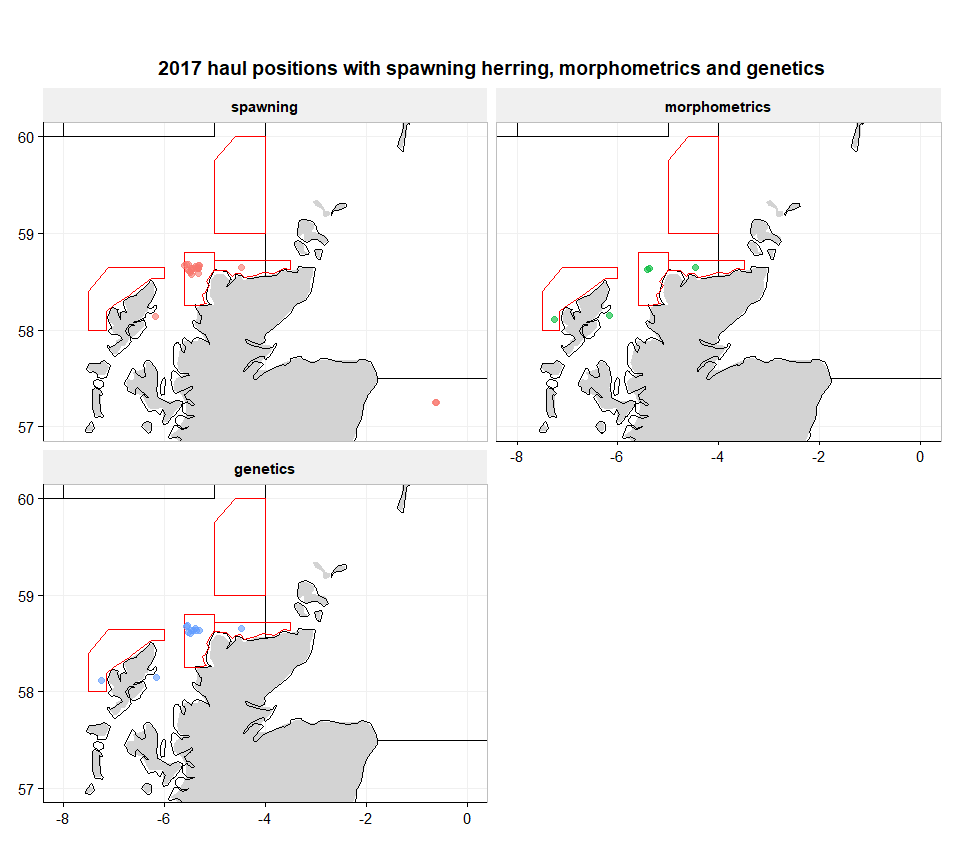
*Table 3.3: overview of the number of spawning herring and the measurements taken on these fish.*

vessel name trip type haul area nlen nwght nage nsex nmat nphoto ngen   
-------- ----------- -------- ------ ------ ------ ------ ------- ------ ------ ------ -------- ------  
FR487 Sunbeam SB0117 S 1 4 7 7 7 7 7 0 0   
FR487 Sunbeam SB0117 S 2 4 49 40 38 40 40 0 0   
FR487 Sunbeam SB0117 S 3 3 177 55 50 55 55 0 0   
FR487 Sunbeam SB0217 C 4 3 136 39 0 39 39 0 39   
FR487 Sunbeam SB0217 C 5 3 157 27 0 27 27 0 0   
FR487 Sunbeam SB0317 C 6 3 121 13 0 13 13 0 0   
FR487 Sunbeam SB0317 C 7 3 127 41 0 41 41 0 41   
FR487 Sunbeam SB0317 C 8 3 107 36 0 36 36 0 36   
FR487 Sunbeam SB0417 C 9 3 130 40 0 40 40 0 40   
FR487 Sunbeam SB0417 C 10 3 94 34 0 34 34 0 34   
FR487 Sunbeam SB0417 C 11 3 125 39 0 39 39 0 39   
KW172 Dirk Dirk DD0817 C 15 3 168 . . . . . .   
KW172 Dirk Dirk DD0817 C 16 3 171 . . . . . .   
KW172 Dirk Dirk DD0817 C 17 . 169 . . . . . .   
KW172 Dirk Dirk DD0817 C 18 . 123 . . . . . .   
KW172 Dirk Dirk DD0817 C 19 . 120 . . . . . .   
KW172 Dirk Dirk DD0817 C 20 . 126 . . . . . .   
KW172 Dirk Dirk DD0817 C 21 . 122 . . . . . .   
KW172 Dirk Dirk DD0817 C 22 . 115 . . . . . .   
KW172 Dirk Dirk DD0817 C 24 . 115 . . . . . .   
KW172 Dirk Dirk DD0817 C 25 . 115 . . . . . .   
KW172 Dirk Dirk DD0817 C 26 . 117 . . . . . .   
KW172 Dirk Dirk DD0817 C 27 . 112 . . . . . .   
KW172 Dirk Dirk DD0817 C 28 . 113 . . . . . .   
KW172 Dirk Dirk DD0817 C 29 . 116 . . . . . .   
KW172 Dirk Dirk DD0817 C 30 . 114 . . . . . .   
KW172 Dirk Dirk DD0817 C 31 . 143 . . . . . .   
KW172 Dirk Dirk DD0817 C 32 . 139 . . . . . .   
KW172 Dirk Dirk DD0817 C 33 . 117 . . . . . .   
KW172 Dirk Dirk DD0817 S 2 2 93 93 93 93 93 93 93   
KW172 Dirk Dirk DD0817 S 3 4 331 137 134 137 137 120 120   
LK419 Antares AT0917 S 1 . 394 77 0 77 77 0 0   
LK419 Antares AT0917 S 2 3 329 129 0 129 129 120 120   
LK419 Antares AT0917 S 4 . 330 128 0 128 128 120 120   
LK419 Antares AT1017 C 5 3 389 131 0 131 131 120 120   
PD265 Lunar bow LB0117 C 9 3 151 62 59 62 62 0 0   
PD265 Lunar bow LB0117 C 10 3 156 65 59 65 65 0 0   
PD265 Lunar bow LB0117 C 11 3 133 58 47 58 58 0 0   
PD265 Lunar bow LB0117 C 12 3 134 65 17 65 65 0 17   
PD265 Lunar bow LB0117 S 1 3 7 7 7 7 7 0 0   
PD265 Lunar bow LB0117 S 2 3 23 23 23 23 23 0 0   
PD265 Lunar bow LB0117 S 4 3 167 59 58 59 59 0 0   
PD265 Lunar bow LB0117 S 5 3 173 58 56 58 58 0 0   
PD265 Lunar bow LB0117 S 7 3 11 11 8 11 11 0 0   
PD265 Lunar bow LB0117 S 8 3 159 60 60 60 60 0 0   
PH2200 Wiron 6 W61017 C 1 . 169 51 25 25 25 0 0   
PH2200 Wiron 6 W61017 C 2 2 282 25 0 0 0 0 0   
PH2200 Wiron 6 W61017 C 4 3 225 49 25 25 25 0 0   
PH2200 Wiron 6 W61017 C 5 3 142 26 0 0 0 0 0   
PH2200 Wiron 6 W61017 C 6 3 183 50 25 25 25 0 0   
PH2200 Wiron 6 W61017 C 7 3 167 50 25 25 25 0 0   
PH2200 Wiron 6 W61017 C 8 3 167 25 0 0 0 0 0   
PH2200 Wiron 6 W61017 C 10 3 118 27 0 0 0 0 0   
PH2200 Wiron 6 W61017 S 9 2 177 26 0 0 0 0 0

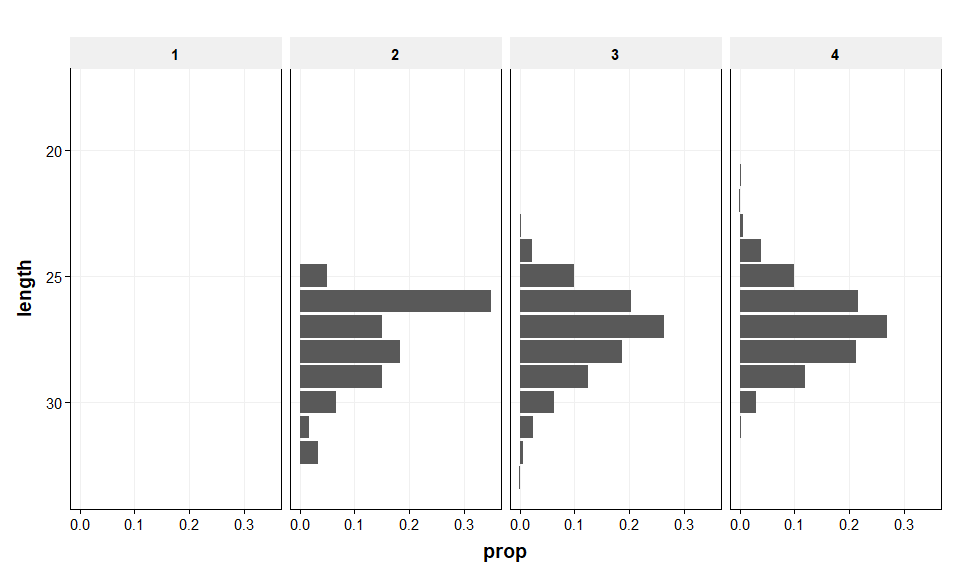
*Table 3.4: overview of haul properties. 'Type' refers to the type of activity (S=survey, C=commercial). The variables starting with 'n' denote the number of fish measured for the specific variable.*



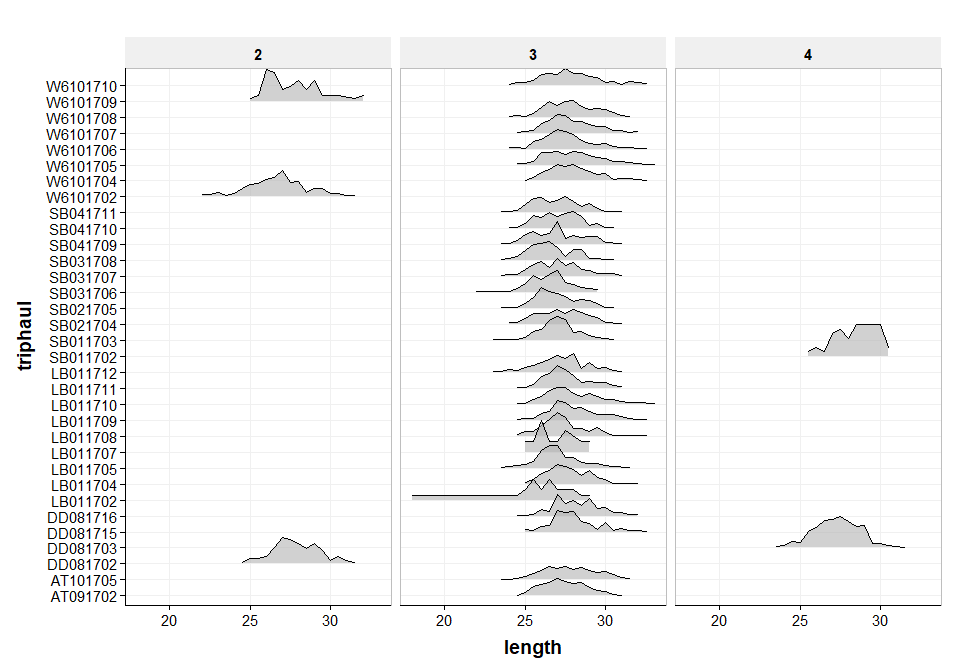
*Figure 3.1: spatial distribution of commercial hauls (C) and survey hauls (S) in the 2017 herring survey*



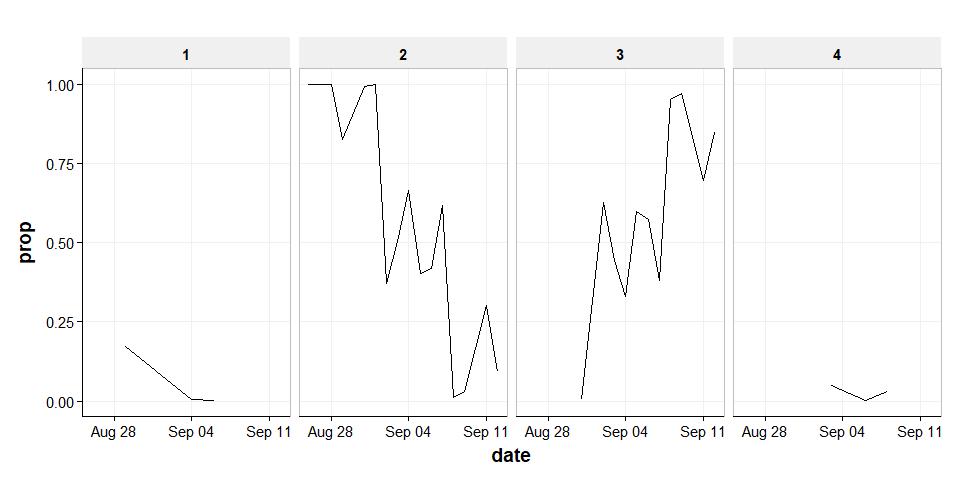
*Figure 3.2: spatial distribution of hauls with spawning herring, morphometric samples and genetic samples in the 2017 herring survey*



*Figure 3.3: Length frequencies of herring catches by survey area*



*Figure 3.4: Haul by haul relative length frequencies of herring by survey area. Triphaul refers to the combination of vessel, trip and haul*



*Figure 3.5: Proportion of maturity stage by date in survey area 3*