In the test folder, we’ve provided you with data on fishing activity within the Mediterranean Sea in 2019. Fishing hours (our standard metric for fishing activity) are binned on a 0.05 degree grid. We’ve also included two shapefiles of closed fishing areas. Please use R, SQL, or a combination of QGIS with either R or SQL to complete the tasks below. Please briefly describe the steps you take to complete each section, and supply the R and/or SQL code along with your solution.

**1. Calculate the total fishing hours, by gear type, inside both closure areas in 2019.**

Combined Closure Areas:

fishing\_class total\_fish\_hrs

<chr> <dbl>

1 drifting\_longlines 38.8

2 fishing 153.

3 set\_gillnets 9.52

4 set\_longlines 1556.

5 trawlers 15883.

6 trollers 0

7 tuna\_purse\_seines 26.1

8 NA 1387.

Closure Area:

fishing\_class total\_fish\_hrs

<chr> <dbl>

1 drifting\_longlines 38.8

Other Closure Area:

fishing\_class total\_fish\_hrs

<chr> <dbl>

1 fishing 153.

2 set\_gillnets 9.52

3 set\_longlines 1556.

4 trawlers 15883.

5 trollers 0

6 tuna\_purse\_seines 26.1

7 NA 1387.

**2. Provide a map or two showing the closure areas overlaid with fishing effort for trawlers and longliners.**

Attached:

Map\_Closure\_trawl\_longline\_2019.png

Map\_Other\_trawl\_longline\_2019.png

**3. Describe a few patterns that you see in the data/maps and comment on how these trends might be impacted by AIS use.**

In the other closure closest to France & Spain:

* There is possibly a relationship between fishing gear type and a nearshore shelf or other bathymetric feature. Trawlers look to operate in shallower waters compared to set longlines. This makes sense that trawlers would have a depth limit in which they could successfully operate. Longlines are likely more suitable for deeper waters.
  + If there is in fact a relationship between trawling and water depth, one could use bathymetric data to cross validate AIS records that report trawling to highlight data where that gear type is unlikely. This may indicate falsified records.
* Drifting longlines look like they mostly operate outside of France’s EEZ, with the exception of a few streaks of activity. I would guess that there is a restriction on drifting longlines in France’s EEZ.
  + AIS data allows us to identify the ships’ names and country of origin that violate this possible gear restriction.
* In this closure, there are 1,387 hours of unclassified fishing activity out of 19,014.92 hours. This makes up about 7% of the fishing in this closed area.
  + AIS use would allow us to fully identify ships and countries of origin fishing in this closure area.
* Trawlers make up the vast majority of fishing in the other closure (~83%), followed by set longlines (~8%) and unclassified fishing gear (~7%).

In the closure off the coasts of Egypt, Gaza Strip, and Israel:

* Only drifting longlines were used in the closed area by two ships from Greece, accounting for about 38 hours. This closure is in close proximity to the EEZ boundary of Egypt, Gaza Strip, and Israel.
  + AIS data allows us to specifically identify which ships violated this fishing closure
* A concentrated amount of trawling is occurring along Israel’s coastline, while a concentrated amount of drifting longlines are set on the southern coast of Cyprus.
* There is less fishing activity in the eastern coast of the Mediterranean compared to the waters adjacent to Spain, France, and Italy.
  + This pattern could be explained by quality of fishing grounds, civil unrest, or perhaps there are more smaller unregistered (no AIS) fishing boats in this part of the Mediterranean.