

# Map of distribution of target species within and adjacent to the Natura 2000 SCI

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Activity Title	Data collection about target species
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Partners Involved	BWI, CNR
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## 1. Research area

The Blue World Institute for Marine Research and Conservation conducted research from July 2019 to March 2021 in northern Adriatic, from the middle part of the island Cres to the Lim channel on the north, that includes two Natura 2000 sites- the Cres-Lošinj Archipelago (HR3000161) and Western Istria (HR5000032), and on the south to the northern part of Dugi otok.

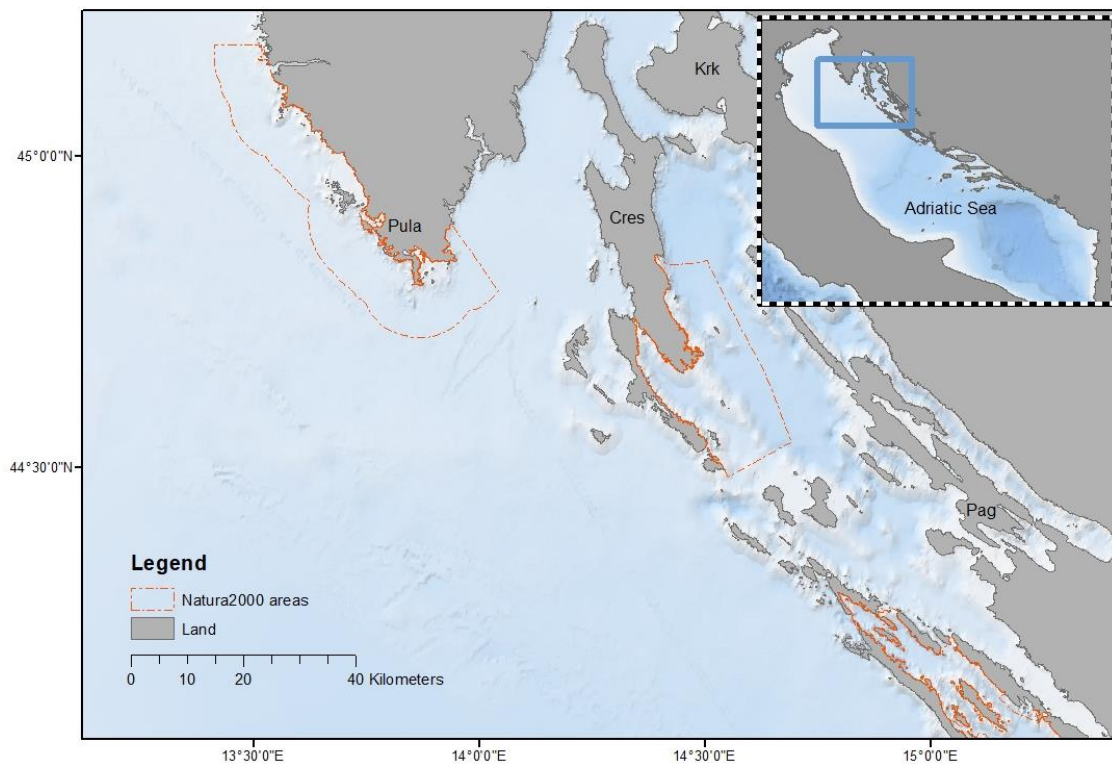


Figure 1: Research area

## 2. The research effort

Distribution data was collected through dedicated boat surveys and the Blue World Institute citizen science app. Fieldwork at sea was conducted using a 6 m inflatable boat with a four-stroke engine 100hp at sea conditions less than four, according to the Beaufort scale and during good visibility. Research effort was determined *ad libitum* according to the weather conditions. The average search speed was 14 knots. At least two experienced researchers were always on board, continually inspecting the horizon in a standing position, covering a 180° range in the direction of the movement of the vessel. Information on the presence of fishing vessels within the study area and the locations of other interesting marine species had been recorded as well. NaviLog application was used to collect the navigation data on a Samsung SM-T550 tablet, developed specifically for the needs of the Blue World Institute.

For the survey, an array of data were recorded: date, time, coordinates of navigation, sea state changes, the weather conditions, the current research activity, the locations of the sightings of target species, group size, age categories within the group, and behaviour within the groups. All the navigation data was transferred to the navigation database using the GIS ESRI ArcMap 10.2 and RStudio to calculate the research effort and obtaining an outline of its spatial distribution (Team (2016), Bivand and Lewin-Koh (2013), C. Brunsdon, Chen, and Brunsdon (2015), South (2011), Bivand and Rundel (2015), McDonald (2016)).

## 3. Encounter rate

A graphical chart of encounter rates of target species in different sections of the study area was made using a grid with a cell size 2x2 km. The total number of target species sightings is divided by the total number of kilometres within each grid cell (ER2) using only the cells in which the total research effort was equal to or greater than 1,414 km (corresponding to half a diagonal of the cell of size 2x2 km) for summer and winter seasons and 5,656 km (corresponding to two diagonals of the cell of size 2x2 km) for the entire two year period. The land area was removed from the grid, and proportional surface area of the sea was calculated within each cell for greater accuracy of results. Subsequently, the minimum effort per grid cell was recalculated as previously obtained minimum effort while divided by the share of the sea within each cell. Encounter rate analysis (ER2) was calculated using ESRI ArcMap 10.2.

## 4. Guidelines to access the target species distribution maps

The data was calculated into the European Environment Agency reference grid (<https://www.eea.europa.eu/data-and-maps/data/eea-reference-grids-2>). Properties of the shape files are:

Geometry Type – Polygon

Projected Coordinate System – ETRS\_1989\_LAEA

Projection – Lambert\_Azimuthal\_Equal\_Area

Geographic Coordinate System – GCS\_ETRS\_1989

Datum – D\_ETRS\_1989

## 5. Definitions

Time frames:

- Summer 1: 2019 -> 07.2019 - 09.2019
- Winter 1: 2019/2020 -> 10.2019 - 05.2020
- Summer 2: 2020 -> 06.2020 - 09.2020
- Winter 2: 2020/2021 -> 10.2020 - 03.2021

Polyline layer:

- Effort\_S\_2019 -> Summer 2019 research effort
- Effort\_W\_2019\_2020 -> Winter 2019/2020 research effort
- Effort\_S\_2020 -> Summer 2020 research effort
- Effort\_W\_2020\_2021 -> Winter 2020/2021 research effort

Point layer:

- Tt\_S\_2019 -> Summer 2019 initial sightings of dolphins
- Cc\_S\_2019 -> Summer 2019 initial sightings of sea turtles
- Trawler\_S\_2019 -> Summer 2019 initial sightings of fishing trawlers
- Tt\_W\_2019\_2020 -> Winter 2019/2020 initial sightings of dolphins
- Cc\_W\_2019\_2020 -> Winter 2019/2020 initial sightings of sea turtles
- TW\_W\_2019\_2020 -> Winter 2019/2020 initial sightings of fishing trawler

- Tt\_S\_2020 -> Summer 2019 initial sightings of dolphins
- Cc\_S\_2020 -> Summer 2019 initial sightings of dolphins
- Trawler\_S\_2020 -> Summer 2019 initial sightings of dolphins
- Tt\_W\_2020\_2021 -> Winter 2020/2021 initial sightings of dolphins
- Cc\_W\_2020\_2021 -> Winter 2020/2021 initial sightings of sea turtles
- TW\_W\_2020\_2021 -> Winter 2020/2021 initial sightings of fishing trawler

Grid layer:

- Grid\_Summer11 -> Summer 2019 encounter rates of dolphins, sea turtles and fishing trawler (Dolphin encounter rate -> Tt\_ER; Turtle encounter rate -> Cc\_ER; Trawler encounter rate -> TW\_ER)
- Grid\_Winter11 -> Winter 2019/2020 encounter rates of dolphins, sea turtles and fishing trawler (Dolphin encounter rate -> Tt\_ER; Turtle encounter rate -> Cc\_ER; Trawler encounter rate -> TW\_ER)
- Grid\_Summer22 -> Summer 2020 encounter rates of dolphins, sea turtles and fishing trawler (Dolphin encounter rate -> Tt\_ER; Turtle encounter rate -> Cc\_ER; Trawler encounter rate -> TW\_ER)
- Grid\_Winter22 -> Winter 2020/2021 encounter rates of dolphins, sea turtles and fishing trawler (Dolphin encounter rate -> Tt\_ER; Turtle encounter rate -> Cc\_ER; Trawler encounter rate -> TW\_ER)

## 6. Annex

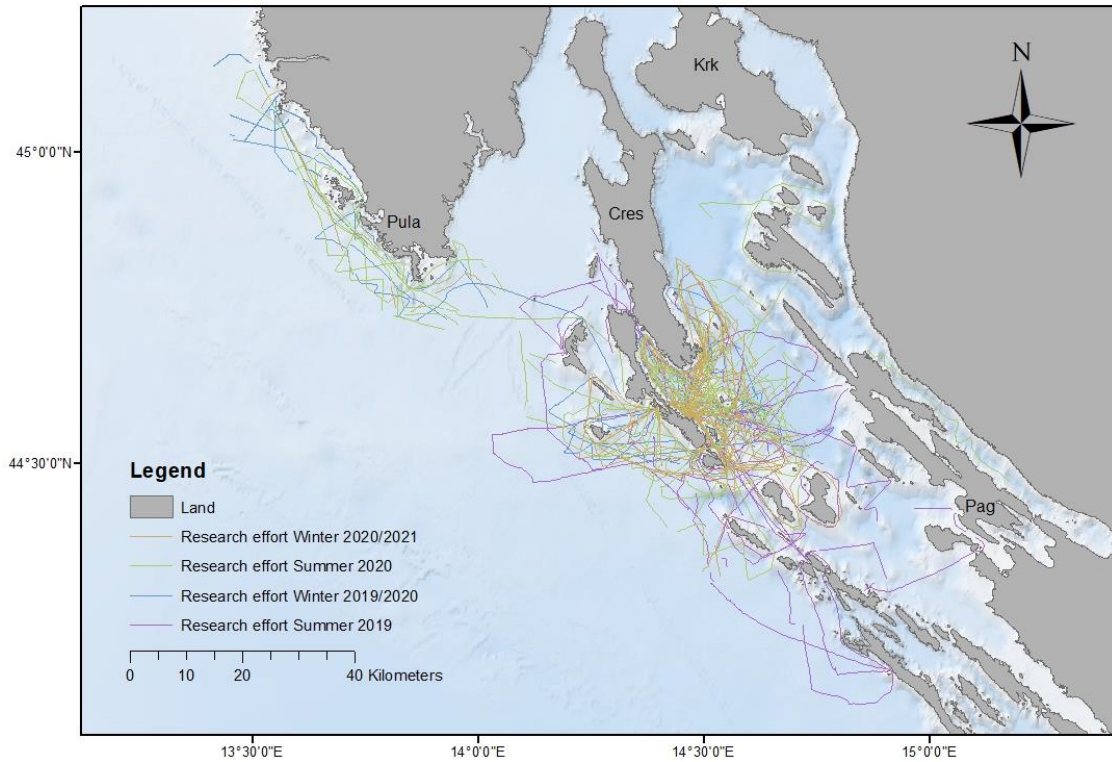


Figure 2: Research effort



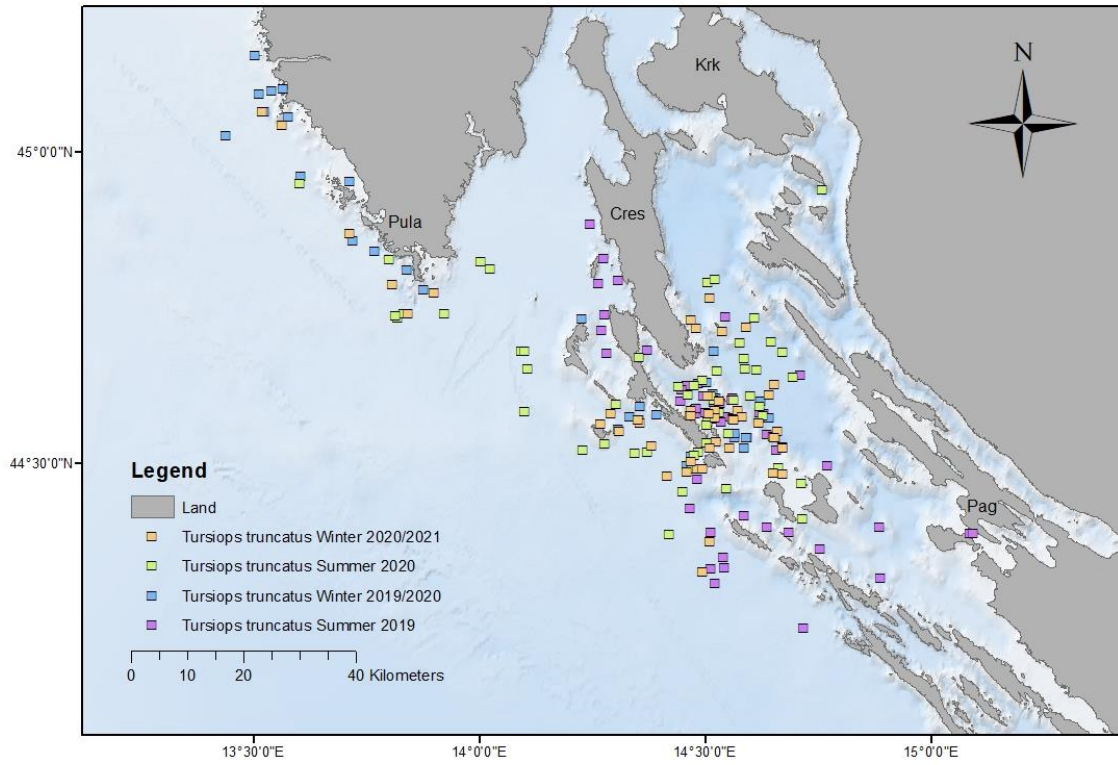


Figure 3: *Tursiops truncatus* encounters point layer

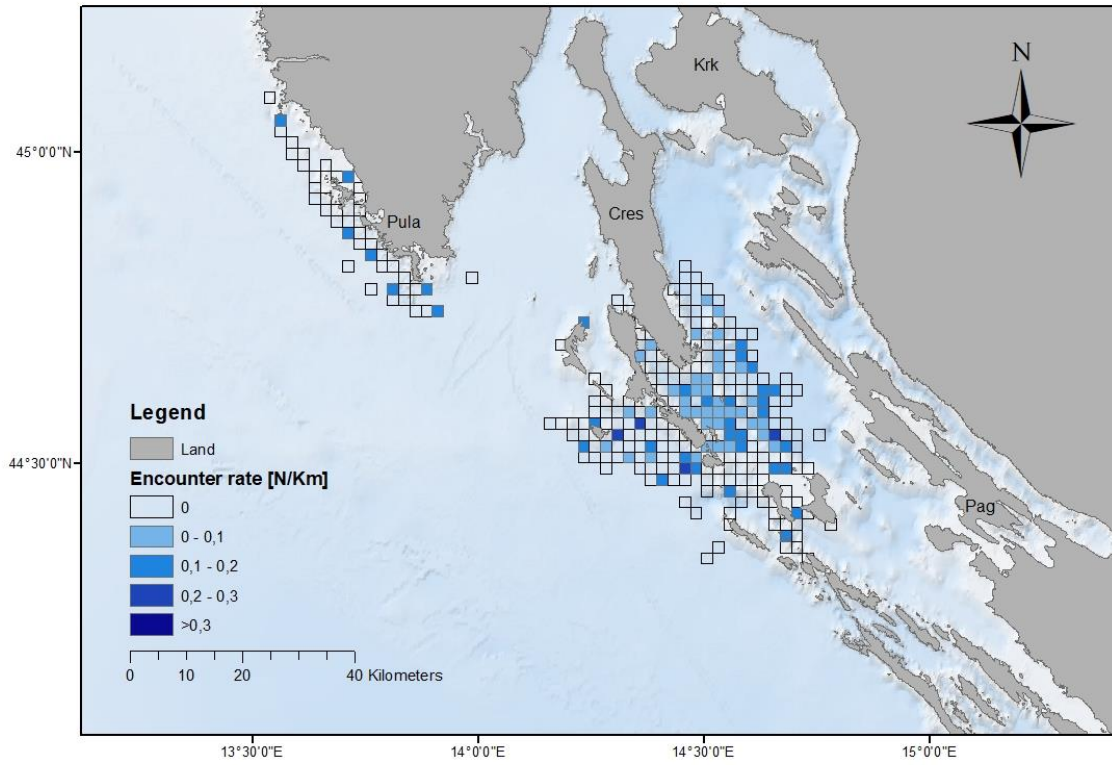


Figure 4: *Tursiops truncatus* encounter rate grid layer (2019-2021)

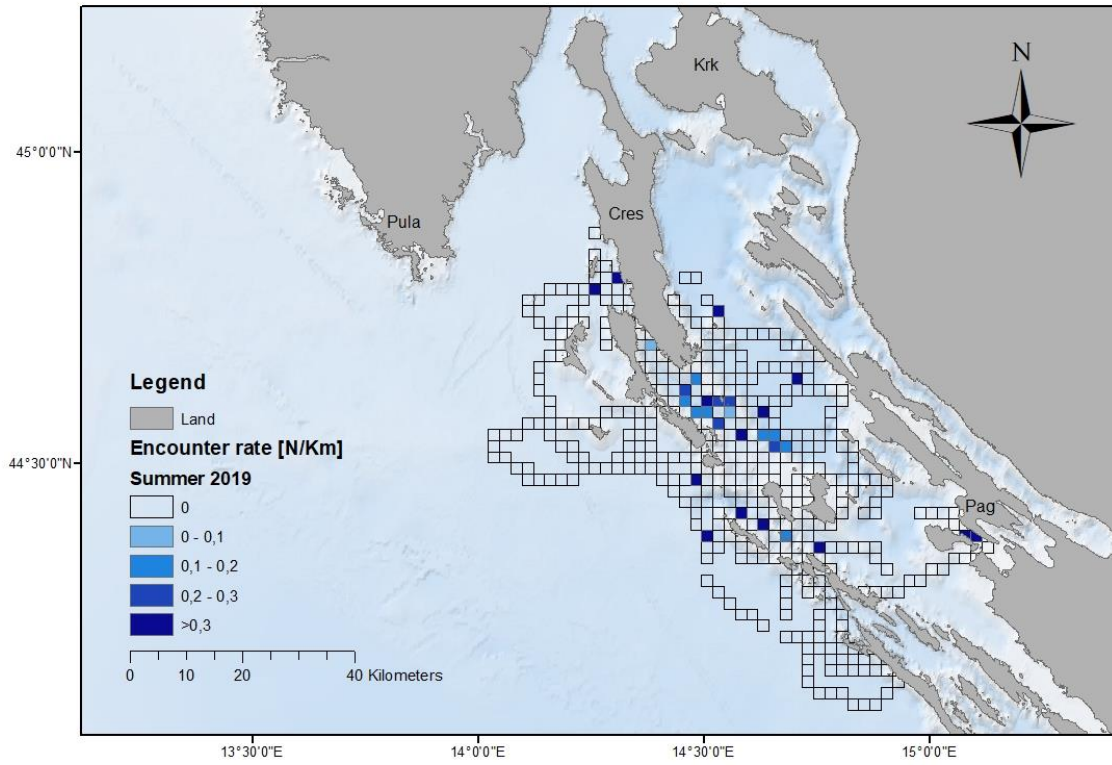


Figure 5: *Tursiops truncatus* encounter rate grid layer (Summer 2019)

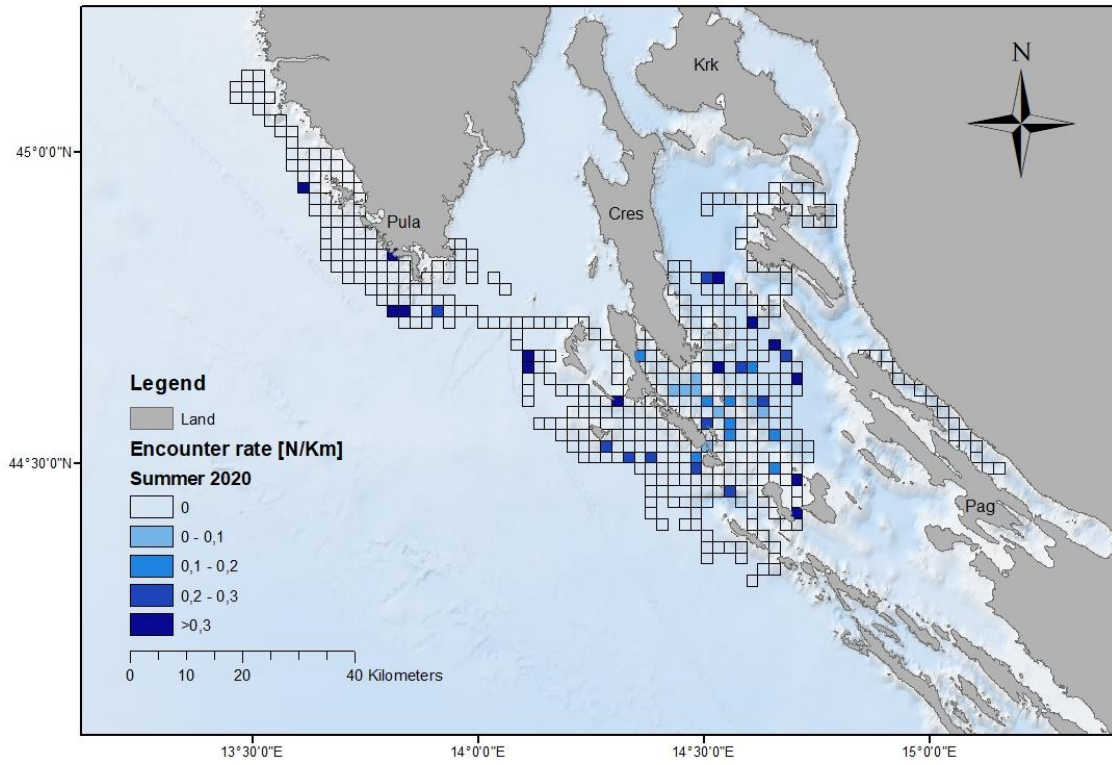


Figure 6: *Tursiops truncatus* encounter rate grid layer (Summer 2020)

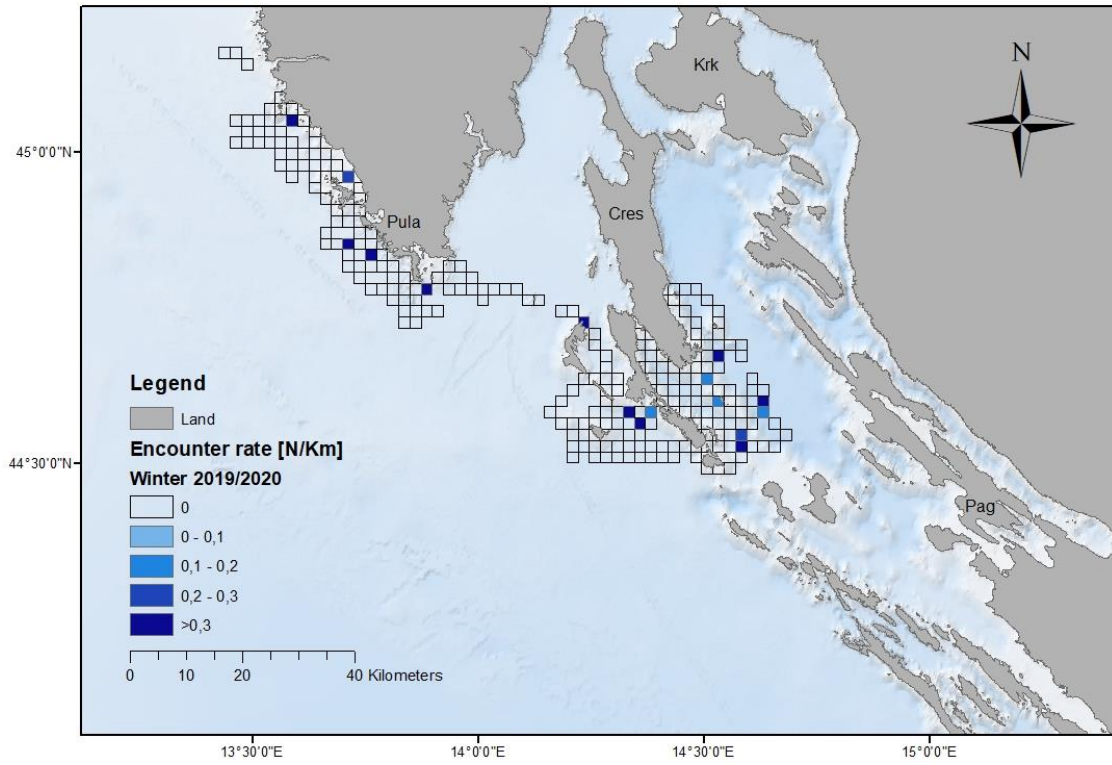


Figure 7: *Tursiops truncatus* encounter rate grid layer (Winter 2019/2020)

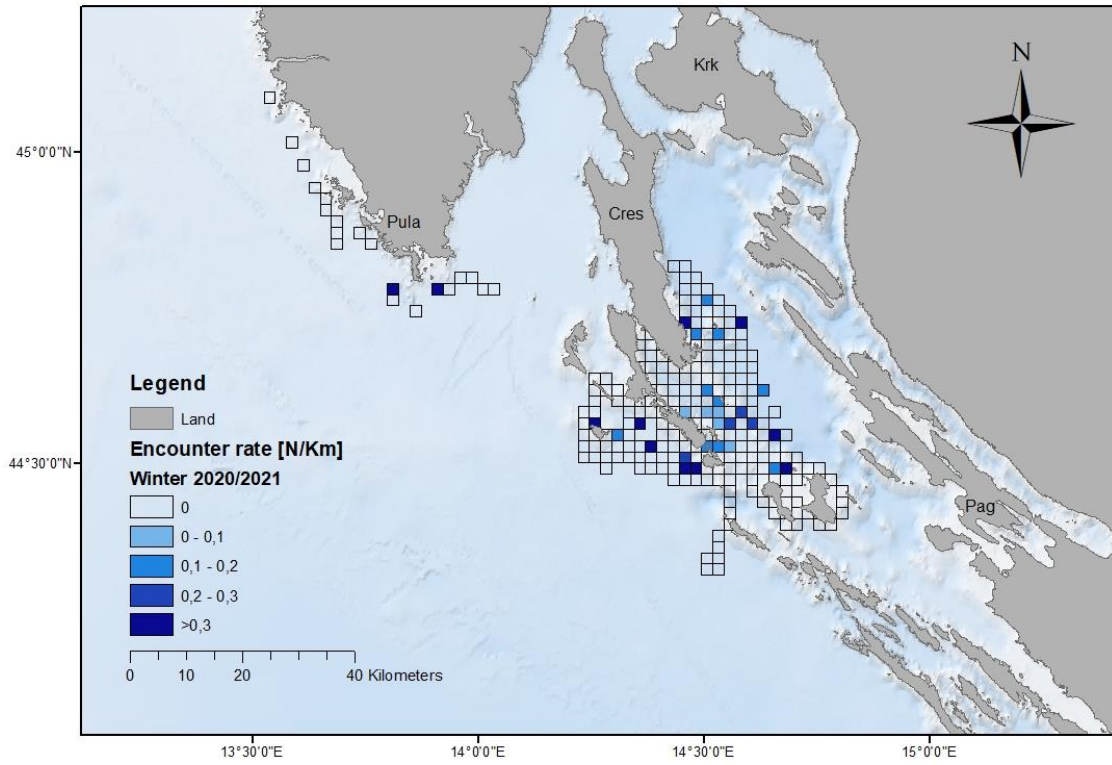


Figure 8: *Tursiops truncatus* encounter rate grid layer (Winter 2020/2021)

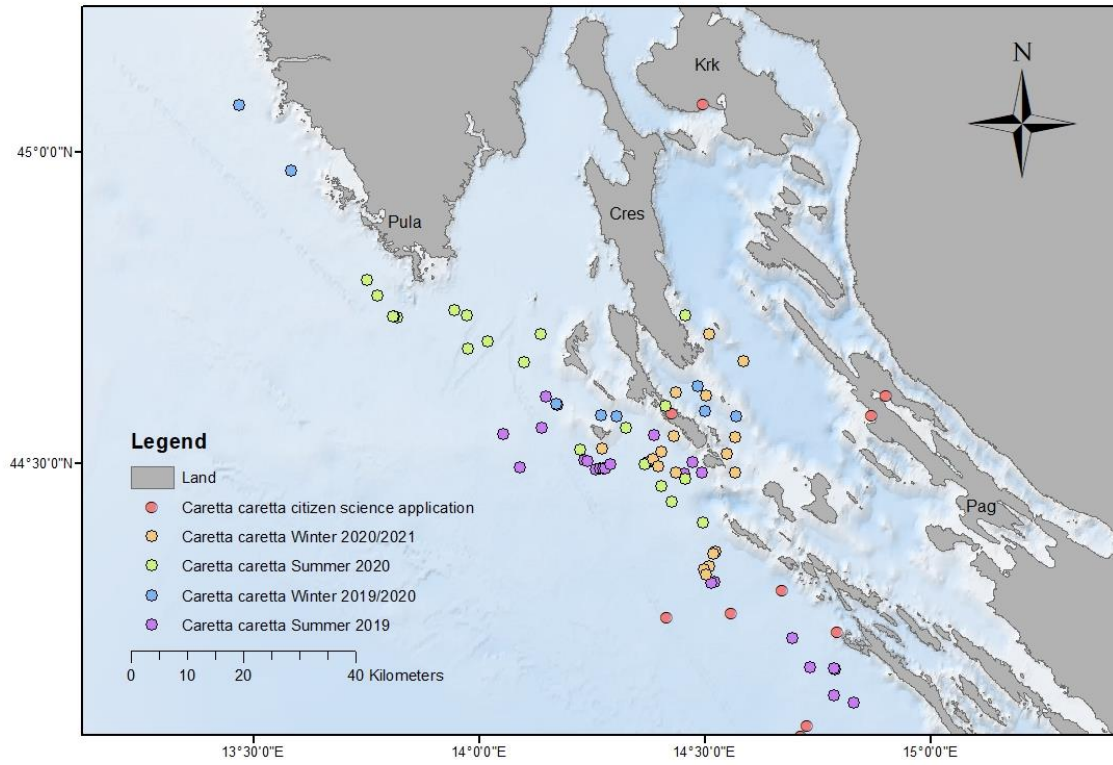


Figure 9: Caretta caretta encounters point layer

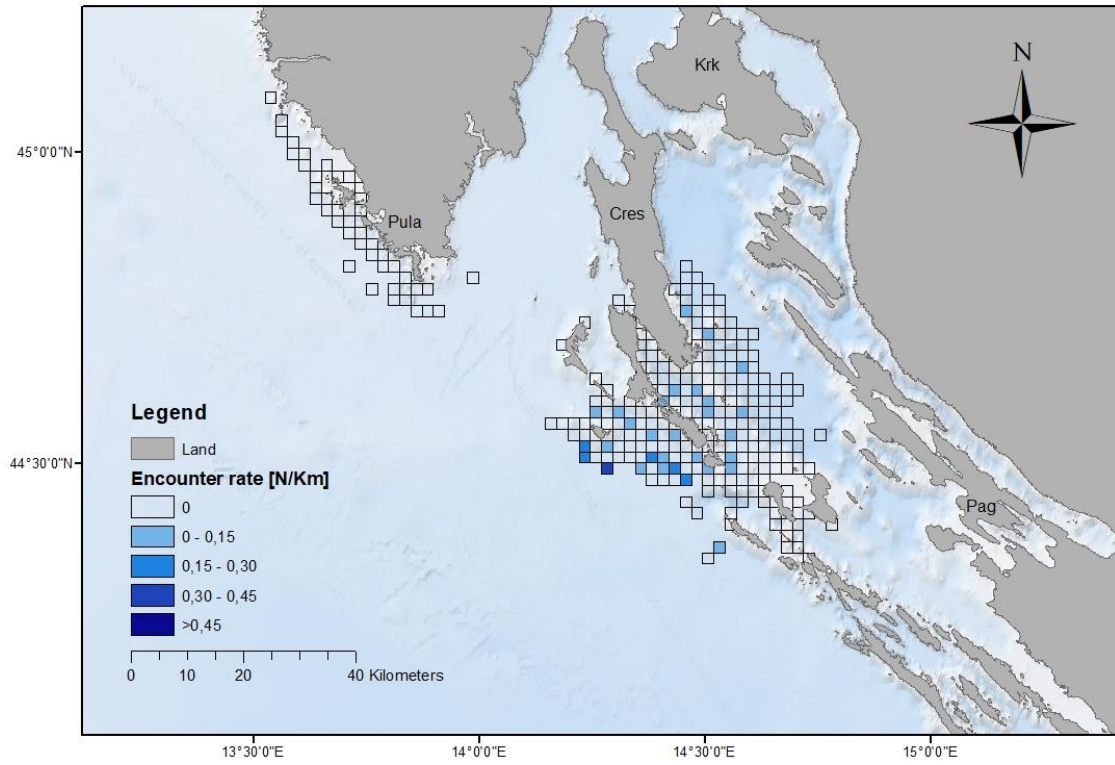


Figure 10: Caretta caretta encounter rate grid layer (2019-2021)



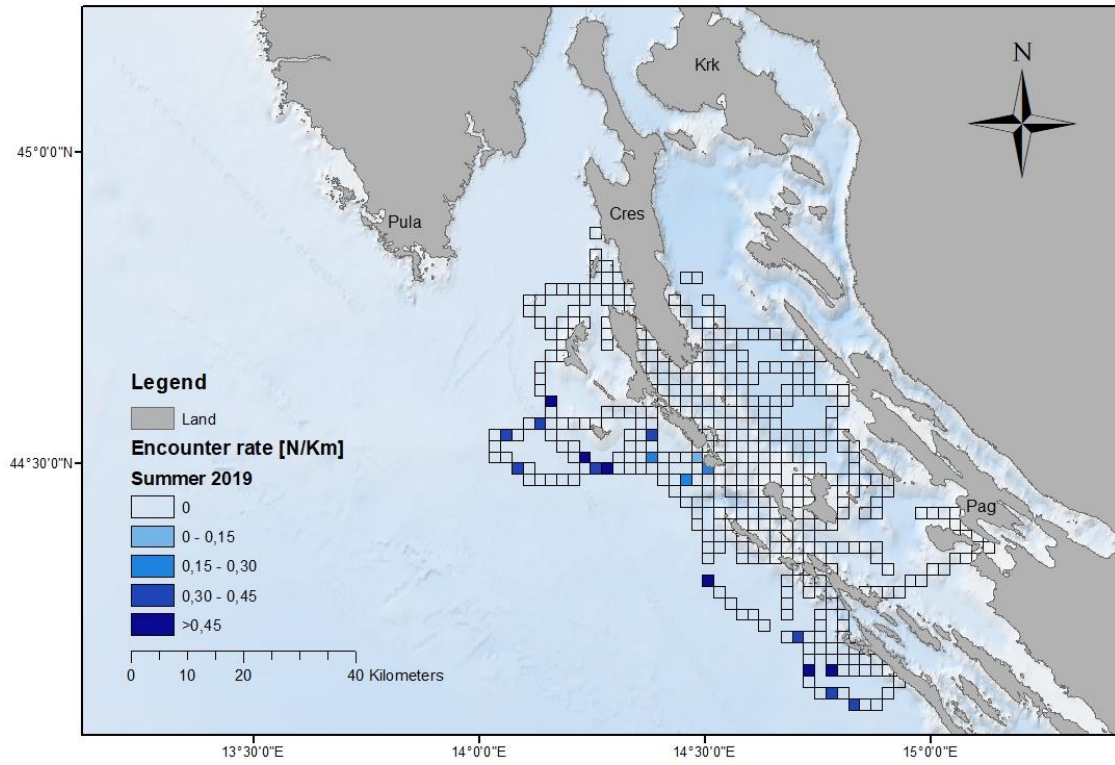


Figure 11: Caretta caretta encounter rate grid layer (Summer 2019)

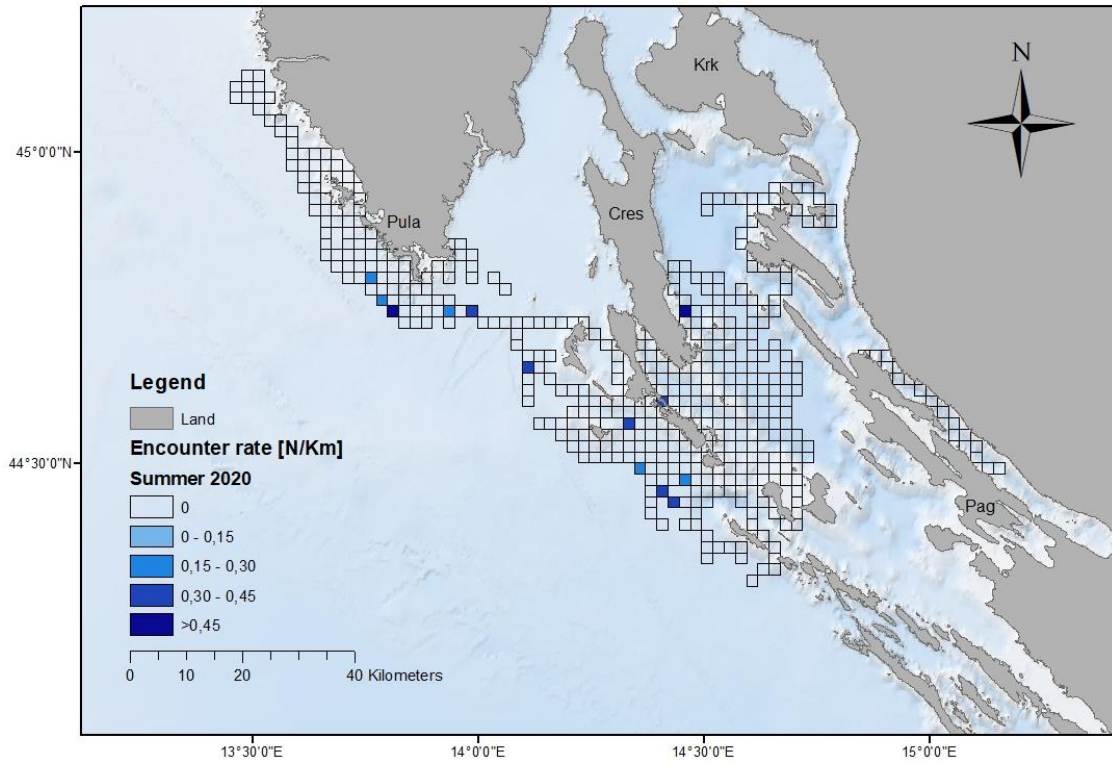


Figure 12: Caretta caretta encounter rate grid layer (Summer 2020)

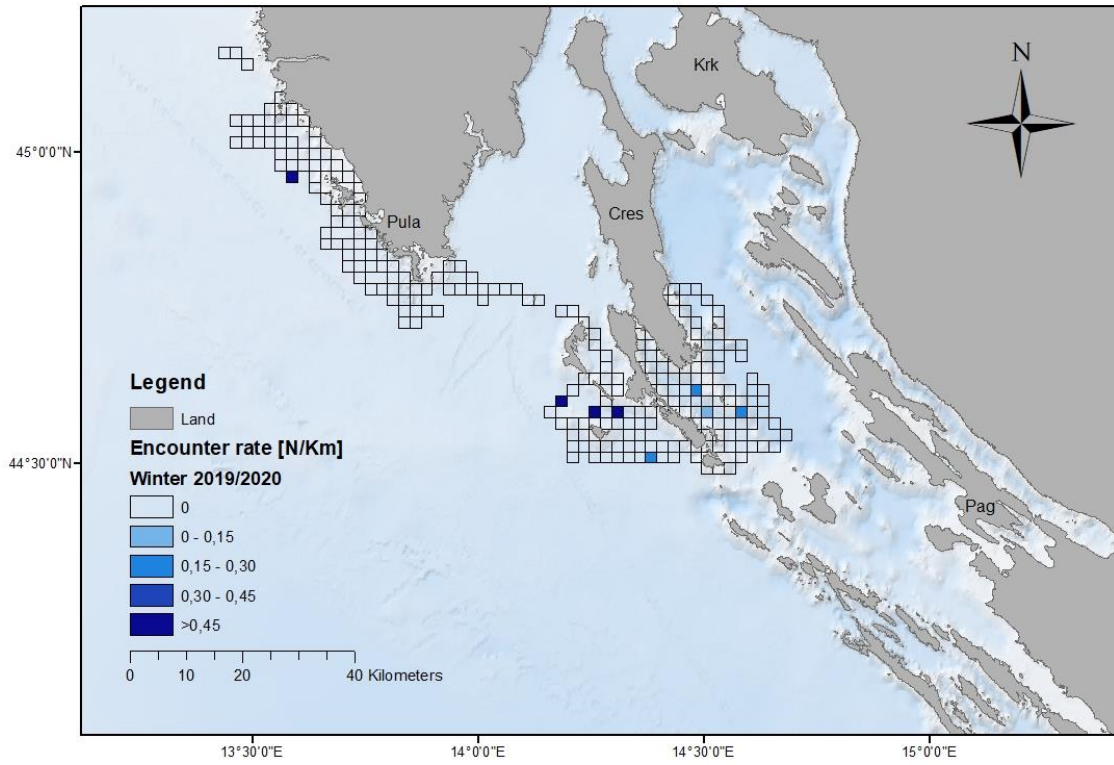


Figure 13: Caretta caretta encounter rate grid layer (Winter 2019/2020)

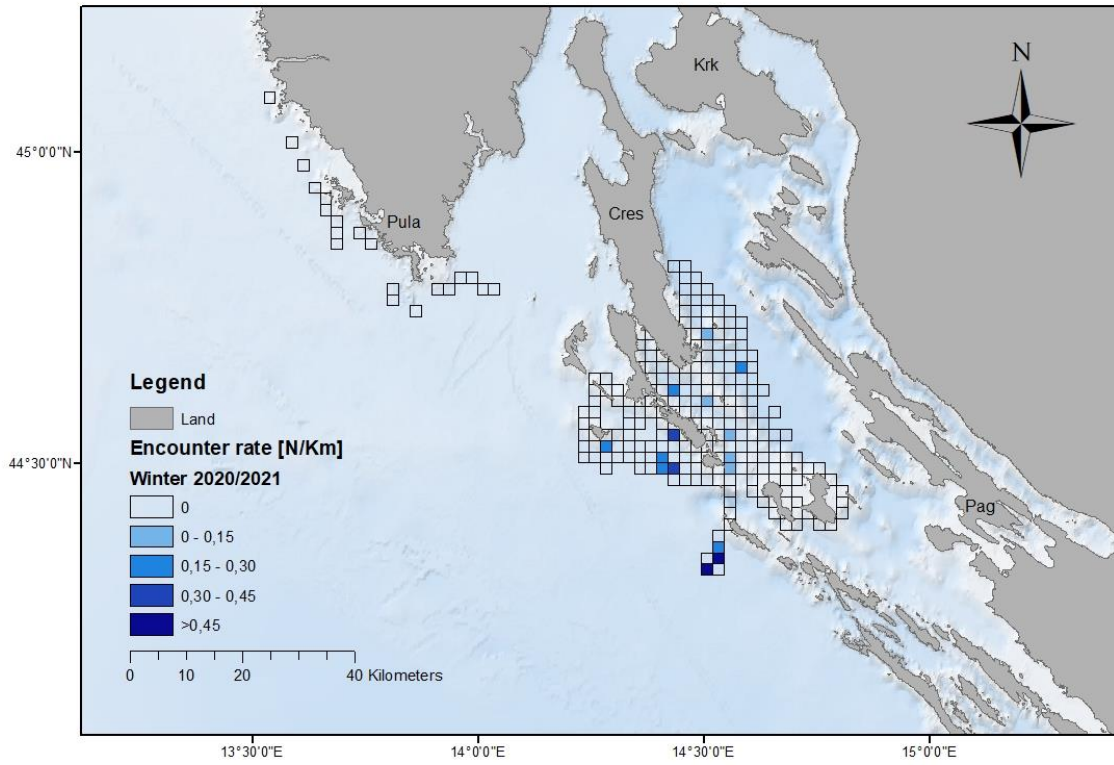


Figure 14: Caretta caretta encounter rate grid layer (Winter 2020/2021)

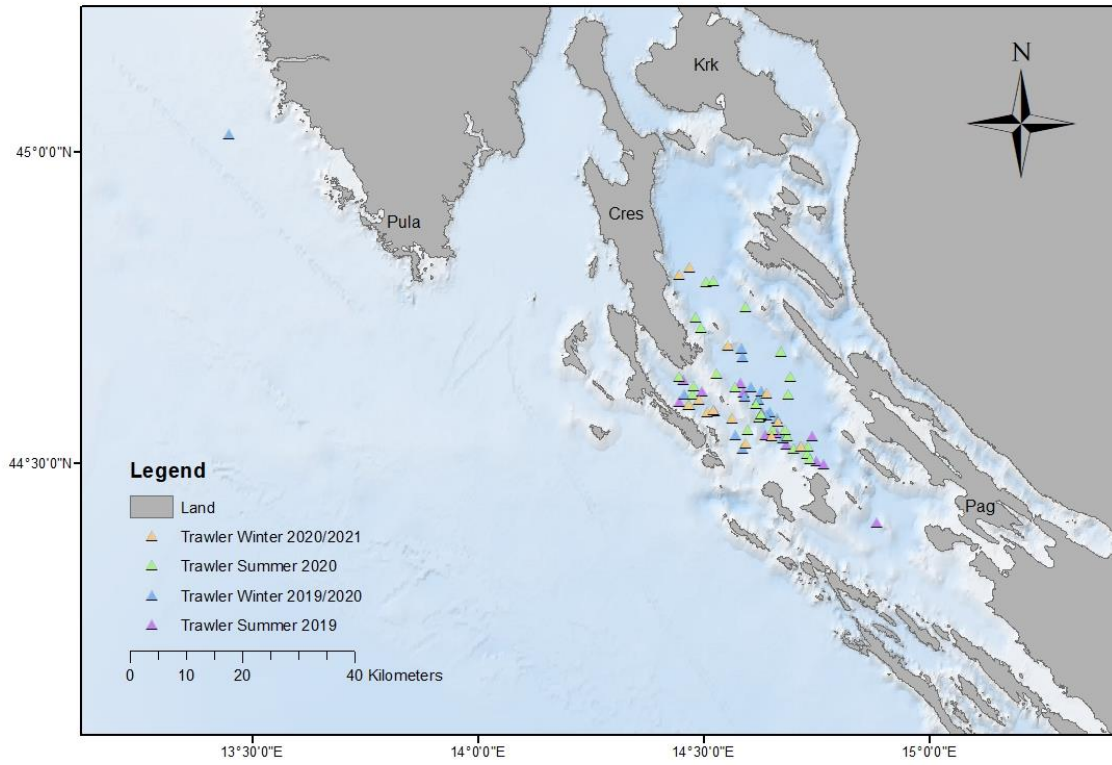


Figure 15: Bottom trawler encounters point layer

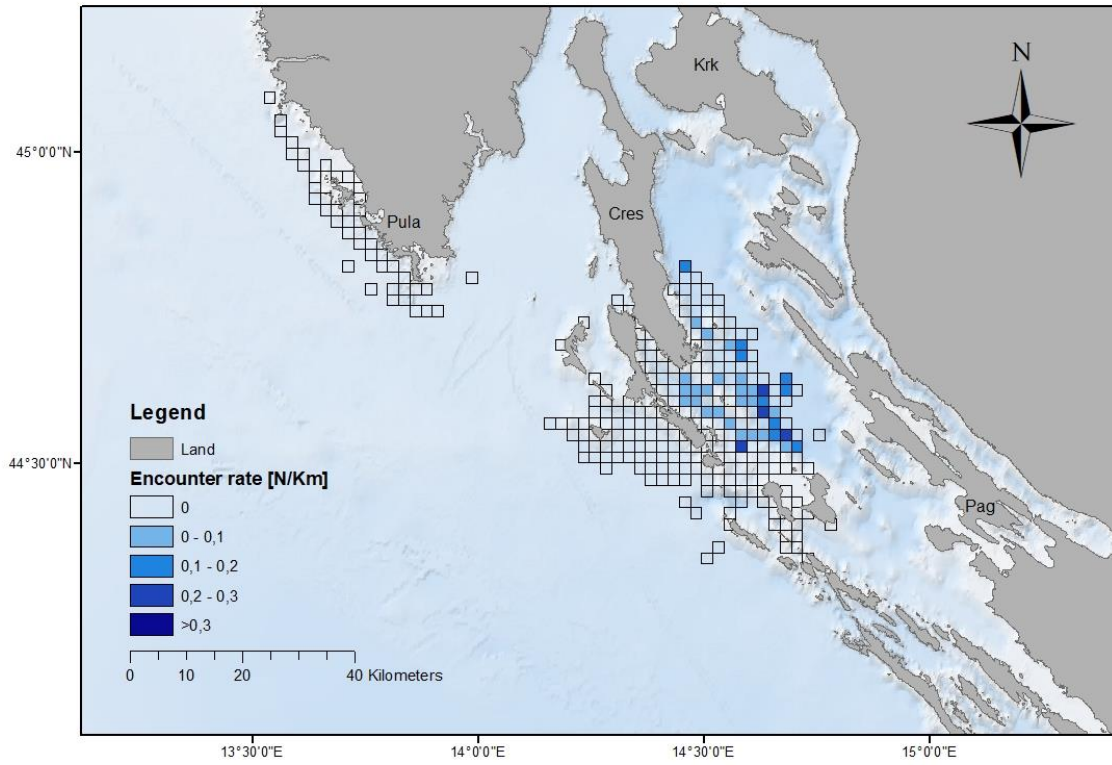


Figure 16: Bottom trawler encounter rate grid layer (2019-2021)

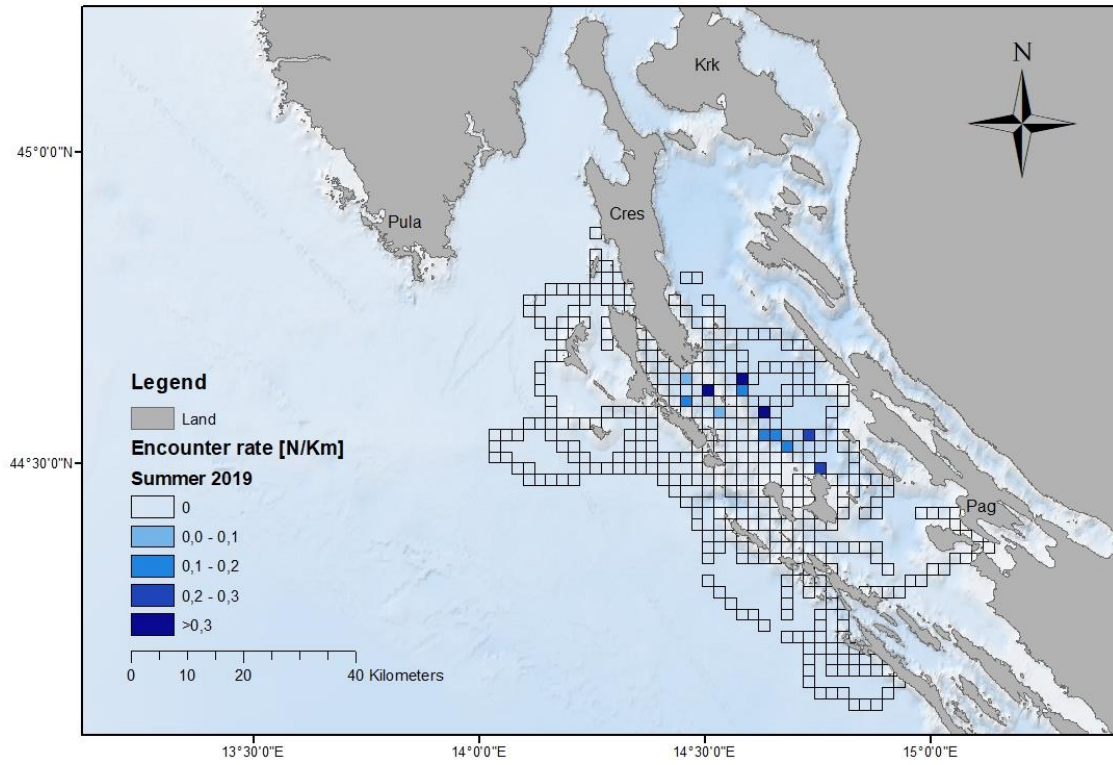


Figure 17: Bottom trawler encounter rate grid layer (Summer 2019)

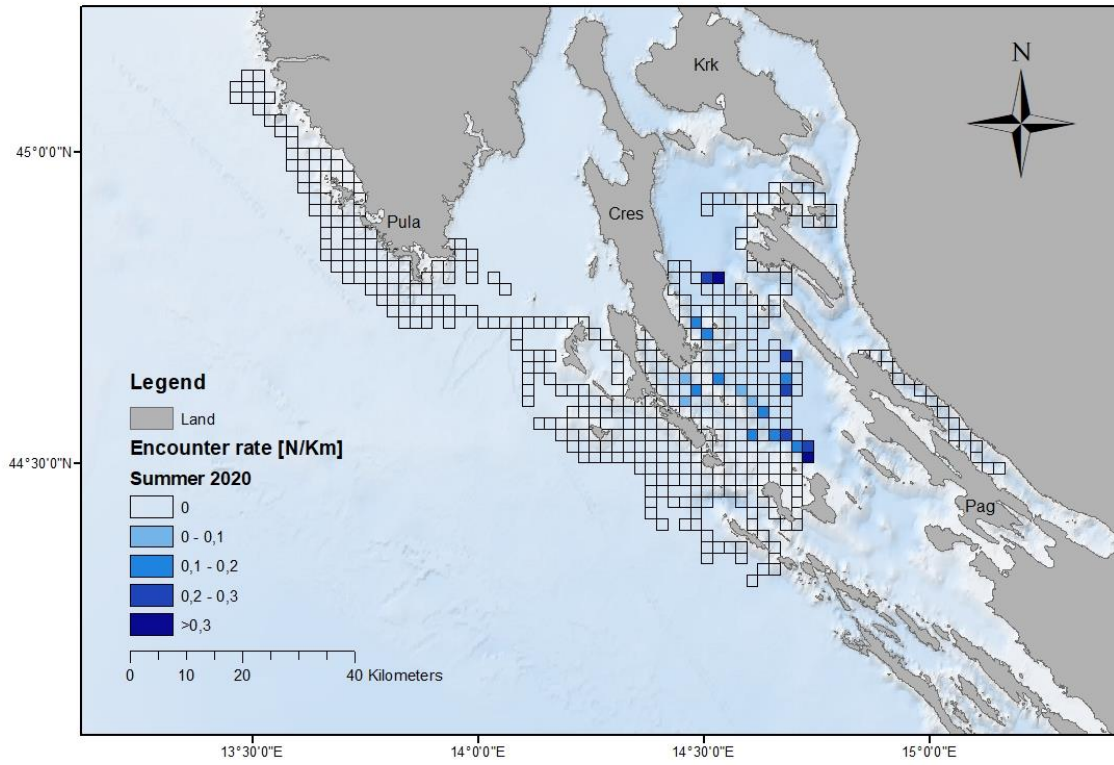


Figure 18: Bottom trawler encounter rate grid layer (Summer 2020)



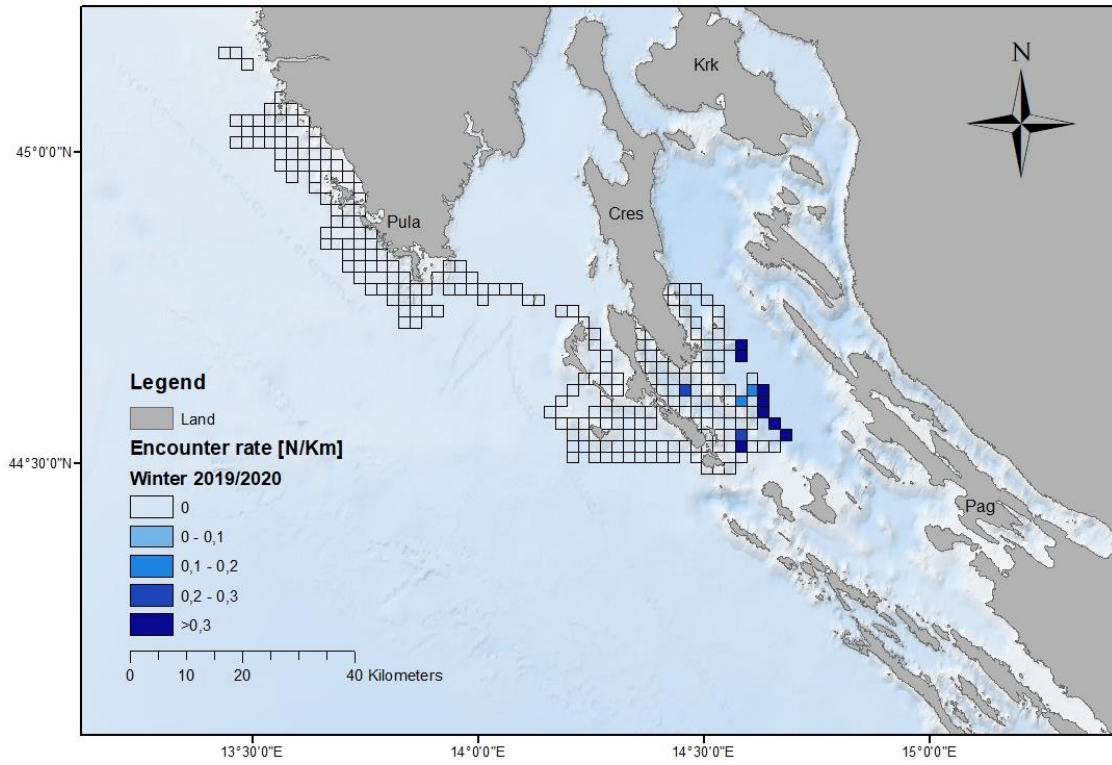


Figure 19: Bottom trawler encounter rate grid layer (Winter 2019/2020)

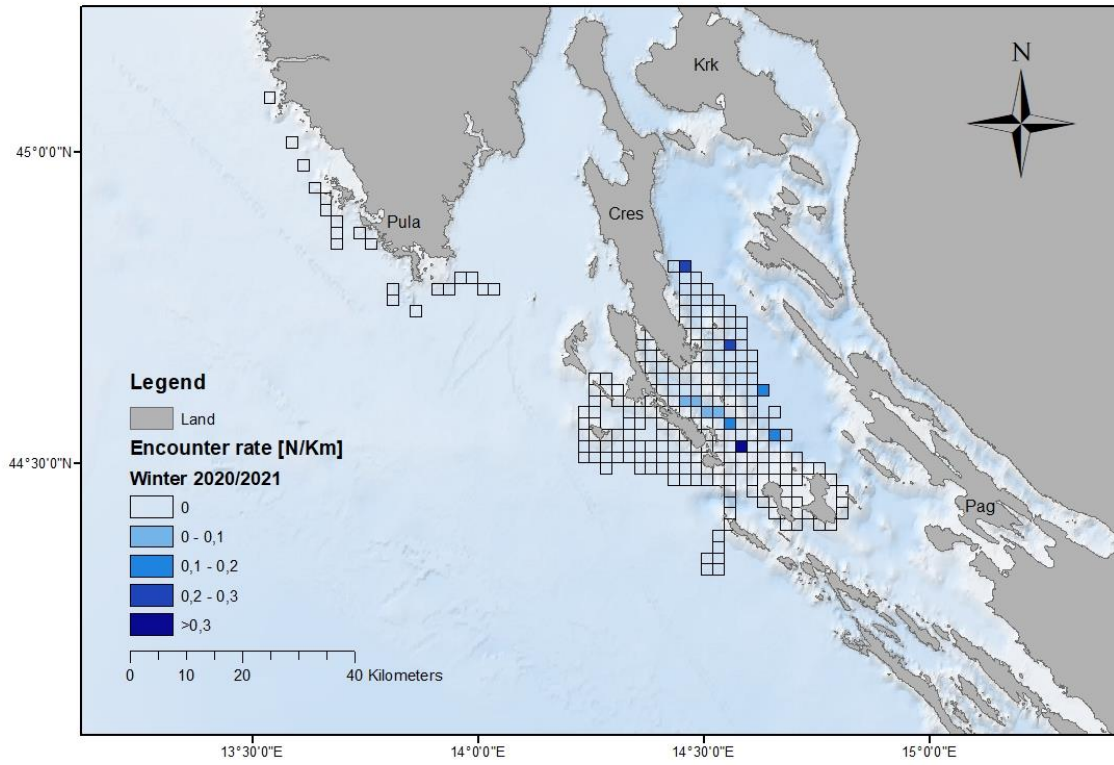


Figure 20: Bottom trawler encounter rate grid layer (Winter 2020/2021)

## 7. Reference

Bivand, Roger, and Nicholas Lewin-Koh. 2013. "Maptools: Tools for Reading and Handling Spatial Objects." *R Package Version 0.8 27*.

Bivand, Roger, and Colin Rundel. 2015. "Rgeos: Interface to Geometry Engine—open Source (Geos). R Package Version 0.3-21." See [https://Cran. R-Project. Org/Package= Rgeos](https://cran.r-project.org/package=Rgeos).

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