**SUPPLEMENTARY MATERIALS**

**Figure S1.** Bhattacharyya’s affinity score (BA) in observed and randomized samples (mean ± sd) between wild and rehabilitated sub-populations of sea turtles.

**Figure S2**. Plot of observed spatial distributions of 16 turtles, differentiating between rehabilitated (n=6) and wild turtles (n=10).

**Figure S3** Mean vessel density maps (hours/km2/month) for 2017-2020; the black dashed lines indicate the different TYS sectors; A) yearly average, B) spring/summer seasonal average; C) autumn/winter seasonal average.

**Figure S4.** Bar plots with error bars showing the mean vessel densities (hours/km2/month), according to vessel type (on the top) and TYS sub-areas (on the bottom); N-TYS=Northern Tyrrhenian Sea; CW- TYS =Central Western Tyrrhenian Sea; CE- TYS =Central Eastern Tyrrhenian Sea; SW- TYS =South Western Tyrrhenian Sea; SE- TYS =South Eastern Tyrrhenian Sea.

**Figure S5.** Standard diagnostic plots (residual plots) based on the fitted generalized additive model. Top-left: normal Q-Q plot; top-right: residuals versus linear predictor; bottom-left: histogram of residuals; bottom-right: response versus fitted values.

**Figure S6.** Residual autocorrelation (top) and partial autocorrelation (bottom) of the fitted Generalized additive model.

**Table S1**. Type and models of satellite tags used for tracking and using different transmission and geolocation methods. SMRU stands for Sea Mammal Research Unit.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **ID** | **Transmission ID/IMEI** | **Tag manufacturer** | **Tag model** | **Transmission method** | **Geolocation method** |
| ***T1*** | 61809 | SMRU | SRDL | ARGOS | Doppler shift |
| ***T2*** | 95128a | Telonics Inc. | A-2025 | ARGOS | Doppler shift |
| ***T3*** | 108717a | Telonics Inc. | TAM-4410 | ARGOS | Doppler shift |
| ***T4*** | 60663a | Telonics Inc. | TAM-4410 | ARGOS | Doppler shift |
| ***T5*** | 128847 | Telonics Inc. | TAM-4410 | ARGOS | Doppler shift |
| ***T6*** | 165768 | SMRU | SRDL | ARGOS | Doppler shift |
| ***T7*** | 162338 | SMRU | SRDL | ARGOS | Doppler shift |
| ***T8*** | 165767 | SMRU | SRDL | ARGOS | Doppler shift |
| ***T9*** | 165769 | SMRU | SRDL | ARGOS | Doppler shift |
| ***T10*** | 165766a | SMRU | SRDL | ARGOS | Doppler shift |
| ***T11*** | 162339 | SMRU | SRDL | ARGOS | Doppler shift |
| ***T12*** | 162340 | SMRU | SRDL | ARGOS | Doppler shift |
| ***T13*** | 162341 | SMRU | SRDL | ARGOS | Doppler shift |
| ***T14*** | 162342a | SMRU | SRDL | ARGOS | Doppler shift |
| ***T15*** | 162343a | SMRU | SRDL | ARGOS | Doppler shift |
| ***T16*** | 165766b | SMRU | SRDL | ARGOS | Doppler shift |
| ***T17*** | 165767b | SMRU | SRDL | ARGOS | Doppler shift |
| ***T18*** | 162342b | SMRU | SRDL | ARGOS | Doppler shift |
| ***T19*** | 162343c | SMRU | SRDL | ARGOS | Doppler shift |
| ***T20*** | 165766 | SMRU | SRDL | ARGOS | Doppler shift |
| ***T21*** | 14218 | SMRU | GPS Phone Tag | GSM | Fastloc GPS |
| ***T22*** | 300434063832850 | Telonics Inc. | SeaTrkr-4370 | IRIDIUM | QFP GPS |

**Table S2.** Yearly and seasonal vessel density averages for the category “All traffic” calculated during 2017-2020 for the whole basin (ALL TYS) and for each sector: N-TYS = Northern Tyrrhenian Sea; CW-TYS = Central Western Tyrrhenian Sea; CE-TYS = Central Eastern Tyrrhenian Sea; SW-TYS = South Western Tyrrhenian Sea; SE-TYS = South Eastern Tyrrhenian Sea.

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|  |  |  | ***VESSEL DENSITY (hrs/km2/month) – Averaged values*** | | | | | | | |
|  |  |  | ***Yearly average*** | |  | ***Spring/summer average*** | |  | ***Autumn/winter average*** | |
| ***Sector*** | ***N. cells*** |  | ***mean±SD*** | ***Range*** |  | ***mean±SD*** | ***Range*** |  | ***mean±SD*** | ***Range*** |
| CE-TYS | 46,882 |  | 0.38±1.31 | 0.001-164.82 |  | 0.53±2.34 | 0-319.71 |  | 0.22±0.43 | 0-37.72 |
| CW-TYS | 25,815 |  | 0.22±0.35 | 0.002-5.18 |  | 0.30±0.47 | 0.003-6.28 |  | 0.15±0.27 | 0-4.18 |
| N-TYS | 8,701 |  | 0.67±0.57 | 0.015-8.09 |  | 0.86±0.75 | 0.031-14.94 |  | 0.48±0.45 | 0-3.34 |
| SE-TYS | 53,220 |  | 0.50±1.95 | 0.004-270.41 |  | 0.66±3.13 | 0.005-507.74 |  | 0.34±1.10 | 0-77.75 |
| SW-TYS | 47,408 |  | 0.16±0.32 | 0.0002-7.32 |  | 0.22±0.44 | 0.0003-10.83 |  | 0.10±0.27 | 0-6.10 |
| ALL TYS | 182,026 |  | 0.35±1.28 | 0.0002-270.41 |  | 0.47±2.10 | 0-507.74 |  | 0.22±0.67 | 0-77.75 |

**Table S3**. Relative probability of turtle-vessel co-occurrences in the different sectors of the Tyrrhenian basin. N-TYS = Northern Tyrrhenian Sea; CW-TYS = Central Western Tyrrhenian Sea; CE-TYS = Central Eastern Tyrrhenian Sea; SW-TYS = South Western Tyrrhenian Sea; SE-TYS = South Eastern Tyrrhenian Sea.

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| ***Relative probability of turtle and vessel co-occurrence*** | | | | | | | | | | | | | | | |
|  |  | All year | | | |  | Spring/summer semester | | | |  | Autumn/winter semester | | | |
| ***Sector*** | ***N. cells*** | ***mean*** | ***st.dev.*** | ***min*** | ***Max*** |  | ***mean*** | ***st.dev.*** | ***min*** | ***max*** |  | ***mean*** | ***st.dev.*** | ***min*** | ***max*** |
| North | 23 | 0.0001 | 0.0003 | 0.0000 | 0.0009 |  | 0.0013 | 0.0026 | 0.0000 | 0.0106 |  | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Central W | 99 | 0.0001 | 0.0001 | 0.0000 | 0.0006 |  | 0.0004 | 0.0007 | 0.0000 | 0.0037 |  | 0.0000 | 0.0001 | 0.0000 | 0.0007 |
| Central E | 177 | 0.0015 | 0.0028 | 0.0000 | 0.0148 |  | 0.0020 | 0.0053 | 0.0000 | 0.0355 |  | 0.0012 | 0.0024 | 0.0000 | 0.0114 |
| South W | 193 | 0.0004 | 0.0006 | 0.0000 | 0.0043 |  | 0.0005 | 0.0010 | 0.0000 | 0.0079 |  | 0.0002 | 0.0002 | 0.0000 | 0.0013 |
| South E | 221 | 0.0029 | 0.0030 | 0.0000 | 0.0144 |  | 0.0022 | 0.0026 | 0.0000 | 0.0143 |  | 0.0034 | 0.0057 | 0.0000 | 0.0349 |

**Table S4**. Results of model selection: degrees of freedom (df), log-likelihood (logLik), corrected Akaike Information Criterion (AICc), differences in AIC score (∆AIC) and Akaike weight (wAIC).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | *df* | *logLik* | *AIC* | *ΔAIC* | *wAIC* |
| mod\_null | 2 | 1616.144 | -3228.3 | 316.86 | 0 |
| mod\_0 | 33 | 1802,.439 | -3531 | 14.07 | 0.001 |
| mod\_1 | 34 | 1811,.152 | -3545.1 | 0 | 0.999 |