water

MDPI

Supplementary Material

# The Effect of Precipitation on the Microbiological Quality of Bathing Water in Areas under Anthropogenic Impact

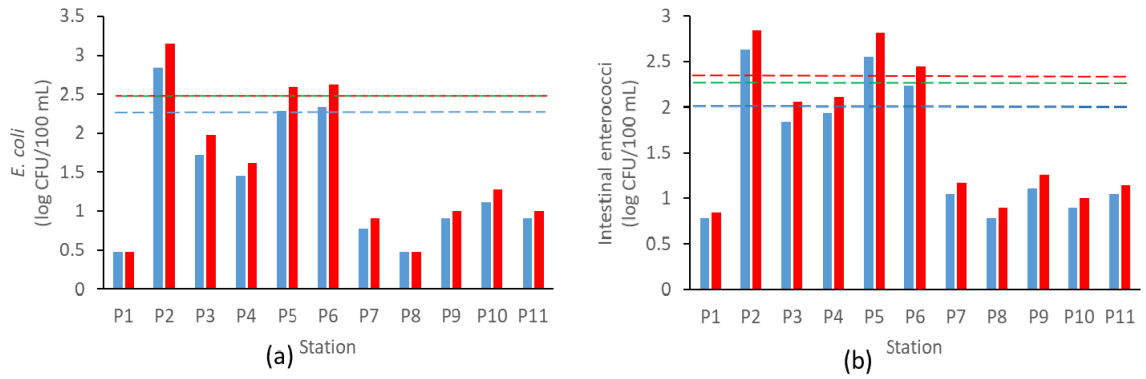



**Figure S1.** Bathing water quality categories based on 90th (blue columns) and 95th (red columns) percentile of all *E. coli* (**a**) and intestinal enterococci (**b**) values for 2020 bathing season. Dashed lines present water quality thresholds (blue—excellent; green—good; red—sufficient).

**Table S1.** Descriptive results (median and IQR values) of parameters measured in the official monitoring.

| Station | PARAMETERS | | | |
|---|---|---|---|---|
| | **Water Temperature (°C)** | **Salinity** | **Intestinal Enterococci (CFU/100 mL)** | ***E. coli* (CFU/100 mL)** |
| P2 | 24.1 (22.6–24.5) | 37.3 (36.5–37.9) | 7(1.2–36.2) | 21 (1.2–43.5) |
| P5 | 23.9 (21.3–26.5) | 36.7 (35.9–37.5) | 13(6.0–35.7) | 8.5 (6.0–52.7) |
| P9 | 23.2(21.4–25.0) | 37.6 (37.2–38.4) | 0(0.0–2.5) | 4 (0.0–11.7) |
| P11 | 23.4 (21.0–24.9) | 37.8 (36.9–38.2) | (0.0–0.0) | 0 (0.0–2.0) |

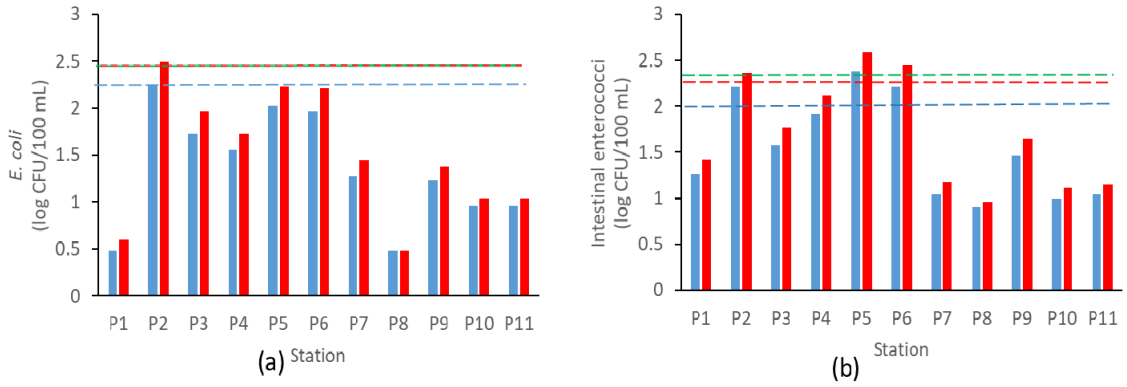



**Figure S2.** Bathing water quality categories based on 90th (blue columns) and 95th (red columns) percentile of all *E. coli* (**a**) and intestinal enterococci (**b**) values for 2021 bathing season. Dashed lines present water quality thresholds (blue—excellent; green—good; red—sufficient).

**Table S2.** Spearman correlation coefficients between the examined variables for 2020 bathing season. Statistically significant correlations ($p < 0.05$) are underlined.

| Parameters | *E. coli* | Intestinal Enterococci | Precipitation |
|---|---|---|---|
| Air temperature | | | |
| Water temperature | 0.126437 | 0.239526 | –0.068828 |
| Salinity | –0.367937 | –0.462449 | –0.024749 |
| pH | –0.049633 | –0.038300 | 0.112064 |
| *E. coli* | 1.000000 | 0.782540 | –0.074372 |
| Intestinal enterococci | 0.782540 | 1.000000 | –0.032513 |
| Precipitation | –0.074372 | –0.032513 | 1.000000 |

**Table S3.** Spearman correlation coefficients between the examined variables for 2021 bathing season. Statistically significant correlations ($p < 0.05$) are underlined.

| Parameters | *E. coli* | Intestinal Enterococci | Precipitation |
|---|---|---|---|
| Air temperature | –0.074408 | –0.097515 | –0.116098 |
| Water temperature | –0.002107 | -0.015015 | 0.012477 |
| Salinity | –0.260116 | –0.166414 | –0.035623 |
| pH | 0.095347 | 0.151594 | 0.104683 |
| *E. coli* | 1.000000 | 0.672104 | 0.124847 |
| Intestinal enterococci | 0.672104 | 1.000000 | 0.094553 |
| Precipitation | 0.124847 | 0.094553 | 1.000000 |

**Table S4.** Spearman correlation coefficients between the examined variables at Split area for 2020 bathing season. Statistically significant correlations ($p < 0.05$) are underlined.

| Parameters | *E. coli* | Intestinal Enterococci | Precipitation |
|---|---|---|---|
| Air temperature | | | |
| Water temperature | 0.128866 | 0.321150 | 0.103584 |
| Salinity | –0.262655 | –0.338889 | –0.058513 |
| pH | –0.103016 | –0.186795 | 0.020233 |
| *E. coli* | 1.000000 | 0.589805 | 0.002943 |
| Intestinal enterococci | 0.589805 | 1.000000 | 0.107082 |
| Precipitation | 0.002943 | 0.107082 | 1.000000 |

**Table S5.** Spearman correlation coefficients between the examined variables at Split area for 2021 bathing season. Statistically significant correlations ($p < 0.05$) are underlined.

| Parameters | *E. coli* | Intestinal Enterococci | Precipitation |
|---|---|---|---|
| Air temperature | 0.054836 | 0.026696 | –0.107612 |
| Water temperature | 0.175207 | 0.091649 | 0.001734 |
| Salinity | –0.021125 | 0.034094 | –0.049991 |
| pH | –0.194797 | –0.164412 | 0.244719 |
| *E. coli* | 1.000000 | 0.492227 | 0.137137 |
| Intestinal enterococci | 0.492227 | 1.000000 | 0.162436 |
| Precipitation | 0.137137 | 0.162436 | 1.000000 |

**Table S6.** Spearman correlation coefficients between the examined variables at Kaštela area for 2020 bathing season. Statistically significant correlations ($p < 0.05$) are underlined.

| Parameters | *E. coli* | Intestinal Enterococci | Precipitation |
|---|---|---|---|
| Air temperature | | | |
| Water temperature | 0.045962 | 0.097748 | –0.334362 |
| Salinity | –0.307827 | –0.402053 | –0.068810 |
| pH | –0.045164 | 0.062349 | 0.243285 |
| *E. coli* | 1.000000 | 0.855783 | –0.074536 |
| Intestinal enterococci | 0.855783 | 1.000000 | –0.074205 |
| Precipitation | –0.074536 | –0.074205 | 1.000000 |

**Table S7.** Spearman correlation coefficients between the examined variables at Kaštela area for 2021 bathing season. Statistically significant correlations ($p < 0.05$) are underlined.

| Parameters | *E. coli* | Intestinal Enterococci | Precipitation |
|---|---|---|---|
| Air temperature | –0.111462 | –0.112434 | –0.132546 |
| Water temperature | –0.146933 | –0.119466 | 0.035248 |
| Salinity | –0.370206 | –0.278600 | –0.065505 |
| pH | 0.310398 | 0.346696 | 0.022455 |
| *E. coli* | 1.000000 | 0.724597 | 0.139418 |
| Intestinal enterococci | 0.724597 | 1.000000 | 0.075085 |
| Precipitation | 0.139418 | 0.075085 | 1.000000 |

**Table S8.** Spearman correlation coefficients between the examined variables measured one day after the rainfall. Statistically significant correlations ($p < 0.05$) are underlined.

| Parameters | *E. coli* | Intestinal Enterococci | Precipitation |
|---|---|---|---|
| Air temperature | –0.097749 | –0.037549 | –0.388653 |
| Water temperature | –0.031499 | 0.145787 | 0.003918 |
| Salinity | –0.290497 | –0.175479 | 0.072237 |
| pH | –0.121640 | –0.073773 | 0.374108 |
| *E. coli* | 1.000000 | 0.743974 | –0.003646 |
| Intestinal enterococci | 0.743974 | 1.000000 | 0.086367 |
| Precipitation | –0.003646 | 0.086367 | 1.000000 |

**Table S9.** Spearman correlation coefficients between the examined variables measured 24 hours after the first sampling. Statistically significant correlations ($p < 0.05$) are underlined.

| Parameters | *E. coli* | Intestinal Enterococci | Precipitation |
|---|---|---|---|
| Air temperature | –0.268623 | –0.219108 | –0.413879 |
| Water temperature | –0.104318 | –0.040086 | –0.075174 |
| Salinity | –0.271915 | –0.207884 | –0.069786 |
| pH | 0.131833 | 0.121664 | 0.253557 |
| *E. coli* | 1.000000 | 0.734360 | –0.068782 |
| Intestinal enterococci | 0.734360 | 1.000000 | –0.049200 |
| Precipitation | –0.068782 | –0.049200 | 1.000000 |

**Table S10.** Spearman correlation coefficients between the examined variables measured 72 hours after the first sampling. Statistically significant correlations ($p < 0.05$) are underlined.

| Parameters | *E. coli* | Intestinal Enterococci | Precipitation |
|---|---|---|---|
| Air temperature | –0.060701 | –0.143118 | –0.204687 |
| Water temperature | 0.042686 | –0.040879 | –0.058510 |
| Salinity | –0.176986 | –0.169925 | –0.034228 |
| pH | –0.137463 | 0.054432 | 0.104782 |
| *E. coli* | 1.000000 | 0.612279 | –0.147919 |
| Intestinal enterococci | 0.612279 | 1.000000 | –0.061859 |
| Precipitation | –0.147919 | –0.061859 | 1.000000 |