

Supplementary Materials for

Environmental factors determine Tuna Fishing Vessels behavior in Tonga

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This file includes:

Figure S1. Correlation analysis.

Table S1. Training results of GAM model.

Table S2. Training results of BRT model.

Table S3. Predicting accuracy of BRT model.

Multi-collinearity

The calculation formula of variance inflation factor (VIF) is:

$$VIF = \frac{1}{1-R_i^2}$$

(S1)

Among them, R_i is the negative correlation coefficient of the independent variable for the regression analysis of the remaining independent variables.

Figure S1. A significant issue of multi-collinearity was identified among the 13 independent variables acquired. The findings indicate that temp100 and chl100, salt100 and chl100, as well as DPT and DO, exhibit strong correlations with correlation coefficients exceeding 0.7.

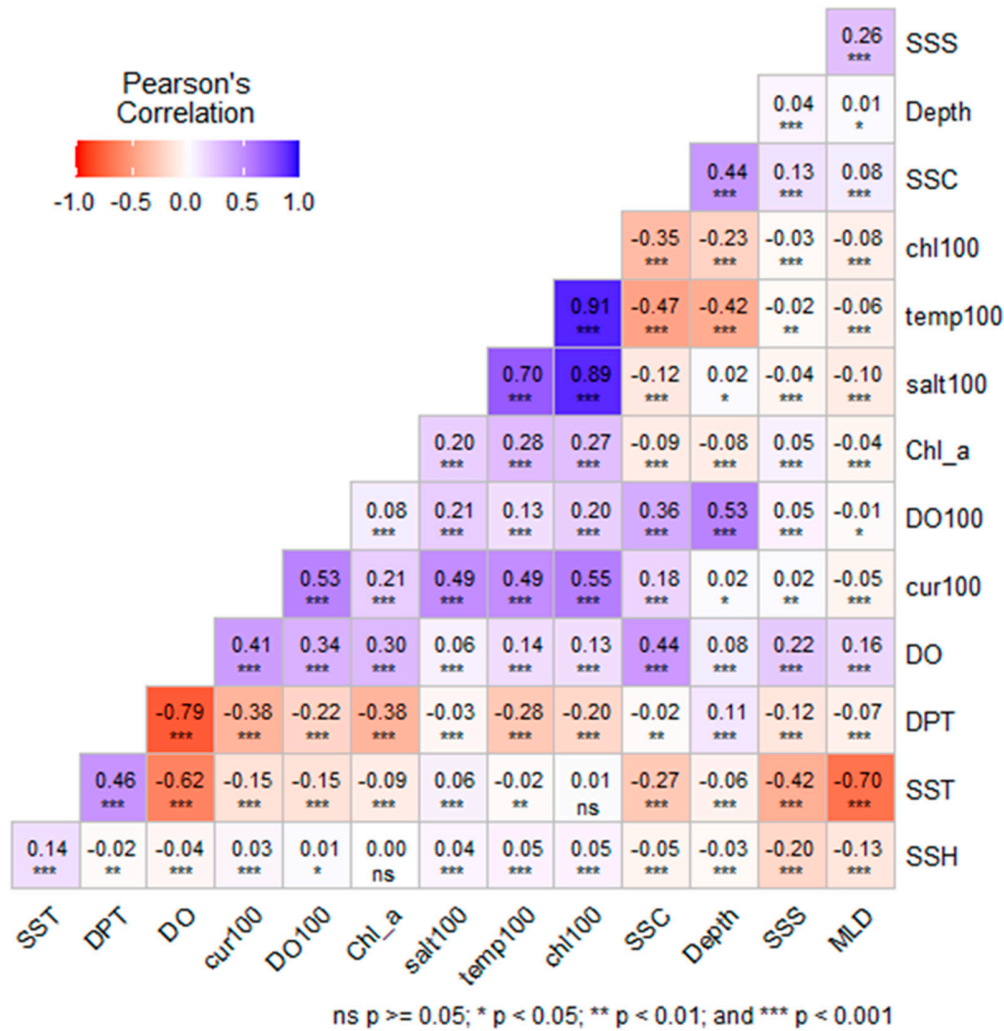


Table S1. The training dataset, on average, demonstrates a 48% explained deviance. The AUC score averages at 0.57, the training TPR score is 0.47, the TNR score is 0.72, and the overall training accuracy rate is 0.52.

<i>Months</i>	Parameters					
	<i>AUC</i>	<i>TPR</i>	<i>TNR</i>	<i>TSS</i>	<i>Deviance explained</i>	<i>Accuracy</i>
1	0.572	0.478	0.565	-0.035	43.4%	0.484
2	0.59	0.423	0.837	0.237	58.3%	0.595
3	0.474	0.936	0.765	-0.076	58.3%	0.526
4	0.593	0.467	0.834	0.236	53.7%	0.591
5	0.596	0.498	0.834	0.236	53.6%	0.591
6	0.592	0.445	0.834	0.236	53.6%	0.594
7	0.651	0.076	0.925	-0.028	44.4%	0.446
8	0.557	0.477	0.256	-0.286	27.8%	0.371
9	0.598	0.471	0.835	0.236	53.7%	0.594
10	0.566	0.475	0.338	-0.245	33.9%	0.415
11	0.512	0.455	0.745	0.276	47.7%	0.465
12	0.523	0.521	0.823	0.211	51.1%	0.554

Table S2. On average, the training dataset exhibits a 39% explained deviance. The AUC score averages at 0.58, with the training TPR score at 0.45, the TNR score at 0.67, the TSS score at 0.12, and an overall training accuracy rate of 0.55.

<i>Months</i>	Parameters					
	<i>AUC</i>	<i>TPR</i>	<i>TNR</i>	<i>TSS</i>	<i>Deviance explained</i>	<i>Accuracy</i>
1	0.536	0.557	0.575	0.122	49.4%	0.564
2	0.557	0.482	0.691	0.165	40.1%	0.573
3	0.682	0.027	1.00	0.027	19.2%	0.475
4	0.544	0.567	0.666	0.168	43.8%	0.577
5	0.556	0.482	0.696	0.165	46.5%	0.576
6	0.674	0.057	1.00	0.053	3.60%	0.481
7	0.516	0.811	0.262	0.079	78.1%	0.561
8	0.673	0.056	1.00	0.057	3.60%	0.488
9	0.542	0.556	0.665	0.166	43.8%	0.574
10	0.534	0.595	0.516	0.116	54.6%	0.567
11	0.554	0.626	0.558	0.148	44.8%	0.569
12	0.615	0.574	0.457	0.137	53.6%	0.586

Table S3. The BRT model's accuracy prediction indicates an average AUC score of 0.62, an average predicted TPR score of 0.85, a TNR score of 0.53, and an overall prediction accuracy rate of 0.72.

<i>Months</i>	Parameters			
	<i>AUC</i>	<i>TPR</i>	<i>TNR</i>	<i>Accuracy</i>
1	0.657	0.696	0.675	0.565
2	0.644	0.835	0.625	0.672
3	0.475	1.000	0.044	0.981
4	0.644	0.799	0.671	0.625
5	0.676	0.837	0.628	0.676
6	0.496	1.000	0.177	0.947
7	0.567	0.937	0.295	0.855
8	0.678	0.838	0.626	0.673
9	0.643	0.836	0.627	0.677
10	0.645	0.794	0.677	0.621
11	0.637	0.856	0.665	0.632
12	0.658	0.817	0.627	0.677