



Use of different modeling approach for sensitivity analysis in predicting the Catch per Unit Effort (CPUE) of fish

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Table S1 — Correlation matrix among independent variables
(Sample size = 138)

Variables	Fishing hour	Chl- <i>a</i>	Kd	PAR	SST
Fishing hour	1				
Chl- <i>a</i>	-0.041	1			
Kd	-0.044	0.990**	1		
PAR	0.061	-0.129	-0.110	1	
SST	0.041	-0.51**	-0.990**	0.131	1

** Correlation is significant at the 0.01 level.

Table S2 — MSE and R on 138 data points in Neural network

Data	Samples	MSE	R
Training	96	0.0359	0.590
Validation	21	0.0422	0.591
Testing	21	0.0328	0.606

Overall on 138 data points (R) = 0.602 and $R^2 = 36.24\%$ and adjusted R^2 square = 33 %

Table S3 — Relative Contribution and rank of the variable in terms of importance

Variable	Sum of the square of Partial Derivative of output variable with respect to input variables	% of Relative contribution	Rank of the variables
Fishing hour	0.00024300	0.085	3 rd
Chl- <i>a</i>	0.21100000	73.95	1 st
Kd	0.07390900	25.90	2 nd
PAR	0.00000708	0.002	5 th
SST	0.00016800	0.058	4 th
Sum	0.28532708		

Table S4 — Relative importance and ranking of the variable under the profile method

Input	Range of predicted response values	Rank of the variables
Fishing hour	0.55	5 th
Chl- <i>a</i>	0.25	1 st
Kd	0.26	2 nd
PAR	0.32	3 rd
SST	0.53	4 th

Table S5 — The rank of input variables with Change in MSE under every incremental noise

Input	10%	20%	30%	40%	50%
Fishing hour	0.00038 (4)	0.0012 (4)	0.000021 (2)	0.001 (5)	0.0004 (4)
Chl- <i>a</i>	0.0013 (5)	0.00015 (3)	0.00019 (3)	6.3E-06 (2)	0.000038 (1)
Kd	0.000015 (2)	0.00005 (2)	0.002 (5)	0.00034 (4)	0.00068 (2)
PAR	0.000025 (1)	0.000031 (1)	0.0003 (4)	0.000025 (3)	0.00018 (3)
SST	0.000869 (3)	0.0007 (5)	0.000044 (1)	4.3E-06 (1)	0.0025 (5)

Table S6 — A matrix containing input–hidden-output neuron connection weights

Hidden neuron Input & output	1	2	3	4	5	6	7	8
Fishing hour	-1.2992	-3.4571	0.9905	-0.1259	-0.5627	1.1689	0.2471	0.9088
Chl- <i>a</i>	-1.0902	-1.1495	0.2478	0.6277	-0.9109	1.7601	1.0916	-1.0889
Kd	-0.814	-0.6159	1.0812	-0.8737	0.099	0.5416	-0.5168	0.3139
PAR	-0.6051	-1.2043	3.2185	-0.1413	0.5492	2.0762	2.5455	-1.2072
SST	0.2906	-0.7406	0.9014	1.559	0.8507	-1.3993	-0.0505	-1.2083
Output[log(CPUE)]	-0.7845	0.3751	-1.1254	1.2442	-0.0891	0.7115	1.258	0.6933

Table S7 — Contribution of each input neuron to the output via each hidden neuron calculated as the product of the input-hidden connection and the hidden-output connection

Hidden neuron Input	1	2	3	4	5	6	7	8	sum
Fishing hour	1.019222	-1.29676	-1.11471	-0.15664	0.050137	0.831672	0.310852	0.630071	0.2738424
Chl- <i>a</i>	0.855262	-0.43118	-0.27887	0.780984	0.081161	1.252311	1.373233	-0.75493	2.8779654
Kd	0.638583	-0.23102	-1.21678	-1.08706	-0.00882	0.385348	-0.65013	0.217627	-1.952264
PAR	0.474701	-0.45173	-3.6221	-0.17581	-0.04893	1.477216	3.202239	-0.83695	0.0186324
SST	-0.22798	-0.2778	-1.01444	1.939708	-0.0758	-0.9956	-0.06353	-0.83771	-1.553145

Table S8 — Relative importance of each input variable in the connection weight method

Input	Sum	Absolute sum	% of Relative contribution	Rank of the variables
Fishing hour	0.2738424	0.2738424	4.101988	4
Chl- <i>a</i>	2.8779654	2.8779654	43.11012	1
Kd	-1.952264	1.9522640	29.24365	2
PAR	0.0186324	0.0186324	0.279103	5
SST	-1.553145	1.5531450	23.26514	3
Total Absolute sum		6.675847		

Table S9 — Relative contribution of each input neuron to the outgoing signal of each hidden neuron and sum of input neuron contribution (taking the absolute value of product using Table S6 &S7)

Hidden neuron Input	1	2	3	4	5	6	7	8	sum
Fishing hour	0.31694	0.48233	0.153819	0.03783	0.18930	0.16828	0.05550	0.19225	1.5962840
Chl- <i>a</i>	0.26596	0.16037	0.038482	0.18863	0.30644	0.25339	0.24522	0.23035	1.6888657
Kd	0.19858	0.08593	0.167904	0.26256	0.03330	0.07797	0.11609	0.06640	1.0087535
PAR	0.14761	0.16802	0.499814	0.04246	0.18476	0.29890	0.57183	0.25537	2.1687892
SST	0.07089	0.10332	0.139982	0.46850	0.28619	0.20145	0.01134	0.25561	1.5373073
								Total sum	8.0000000

Table S10 — Relative importance of each input variable

Input ↓	Relative Importance (%)	Rank
Fishing hour	$((1.5962840/8)*100) = 19.95$	3
Chl- <i>a</i>	$((1.6888657/8)*100) = 21.11$	2
Kd	$((1.0087535/8)*100) = 12.60$	5
PAR	$((2.1687892/8)*100) = 27.10$	1
SST	$((1.5373073/8)*100) = 19.21$	4

Table S11 — Ranking of variables under the forward & backward stepwise method

Method ↓ Input ↓	Rank of variables (Forward stepwise)	Rank of variables (Backward stepwise)
Fishing hour	3	3
Chl- <i>a</i>	4	4
Kd	1	2
PAR	2	1
SST	5	5

Supplementary Figures

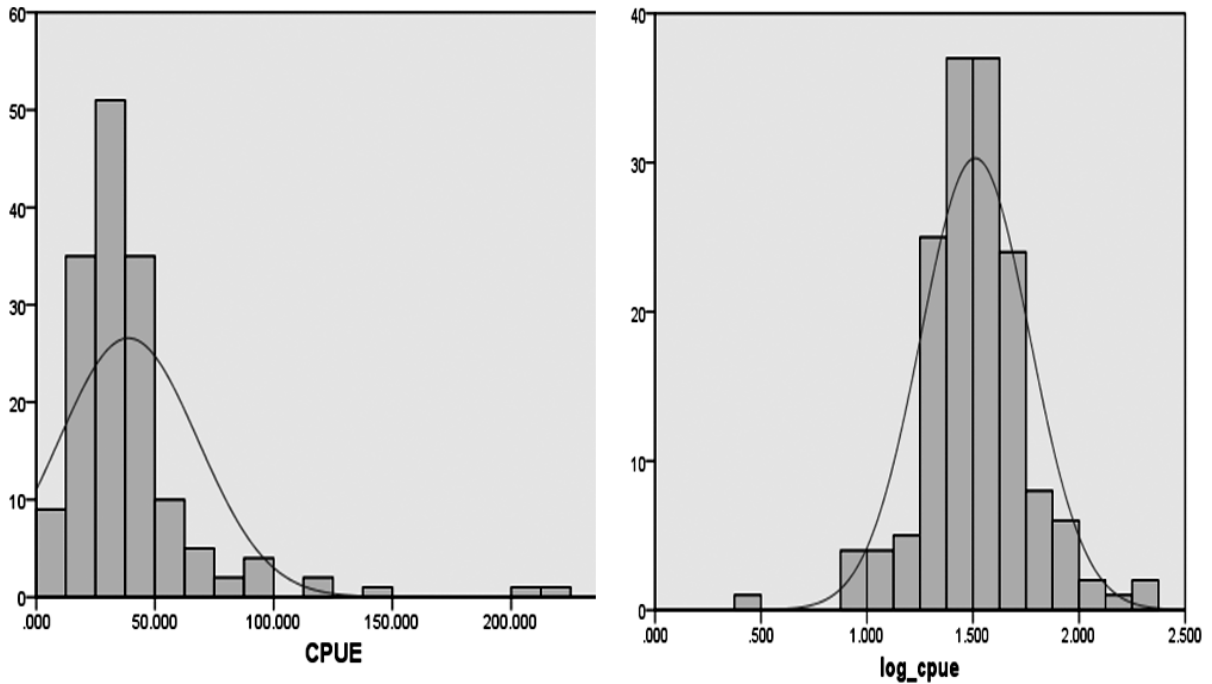


Fig. S1 — Distribution of CPUE and log(CPUE)

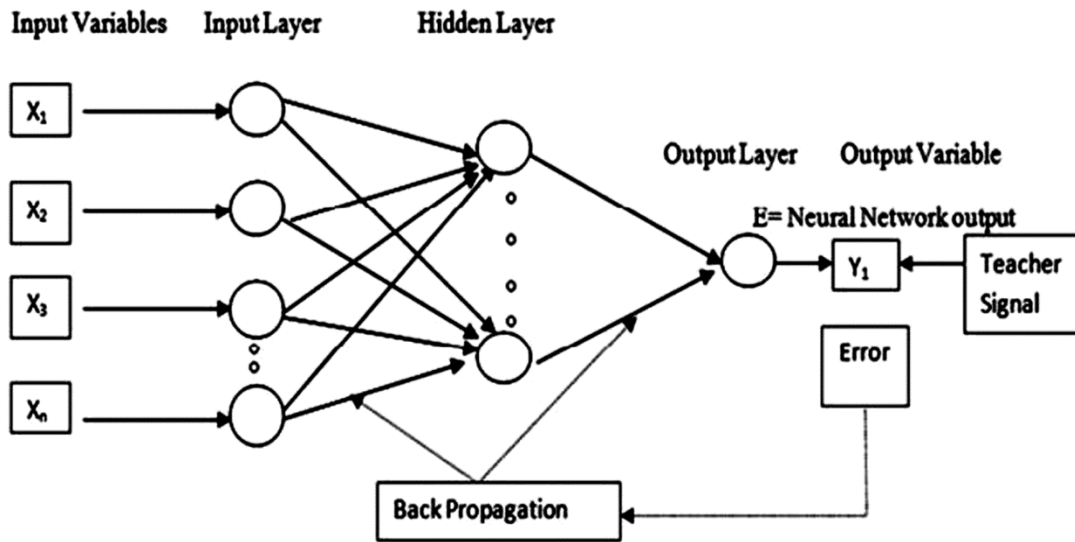


Fig. S2 — Structure of artificial neural network (Yadav *et al.*¹⁰)

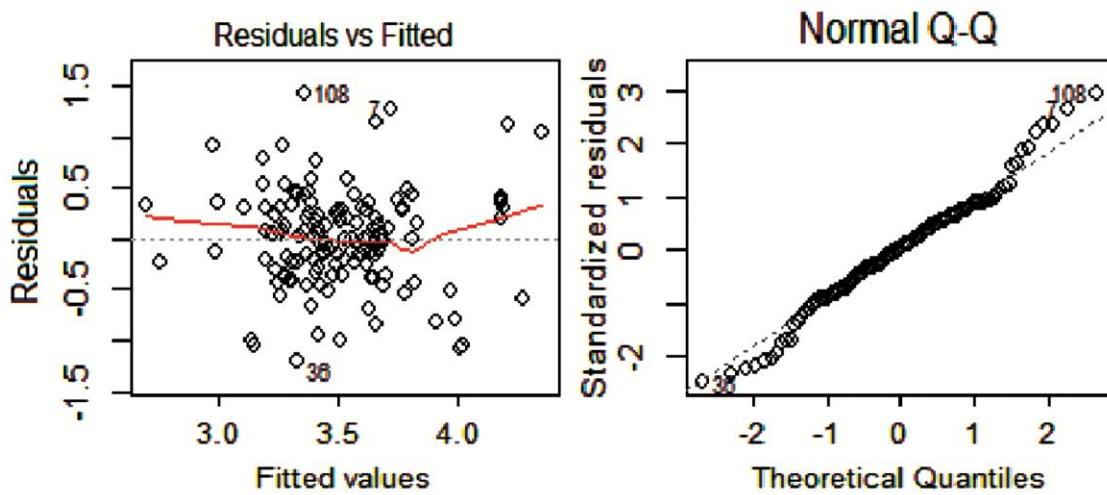


Fig. S3 — Standardized residuals vs. predicted values & Normal Q-Q plot in general linear model for log(CPUE) prediction

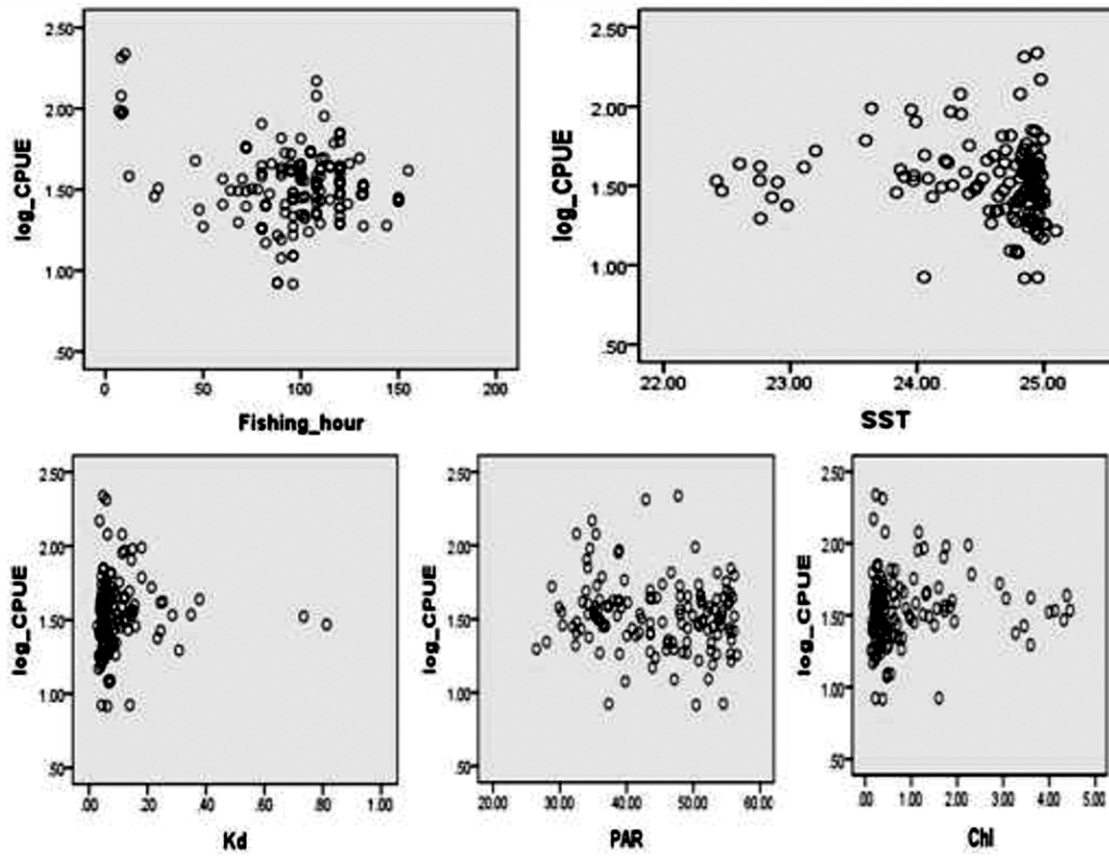


Fig. S4 — Scatter plots of predictor variables with log-transformed CPUE