Supplement of Earth Syst. Dynam., 17, 795–810, 2026
https://doi.org/10.5194/esd-17-795-2026-supplement

Earth System Dynamics
Open Access
EGU

Supplement of

Deep learning-based chlorophyll prediction: comparison with a dynamic model and applications to fish catch forecasting

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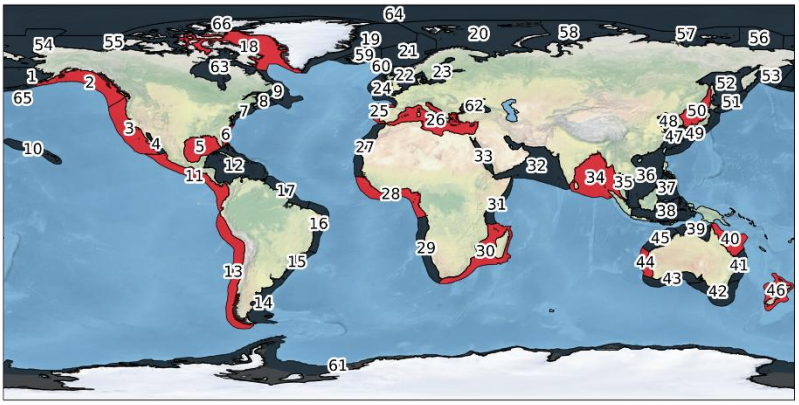
Supplementary

(a)



(b)

1	East Bering Sea	18	Canadian Eastern Arctic	35	Gulf of Thailand	52	Sea of Okhotsk
2	Gulf of Alaska	19	East Greenland Shelf	36	South China Sea	53	West Bering Sea
3	California Current	20	Barents Sea	37	Sulu-Celebes Sea	54	Chukchi Sea
4	Gulf of California	21	Norwegian Shelf	38	Indonesian Sea	55	Beaufort Sea
5	Gulf of Mexico	22	North Sea	39	North Australian Shelf	56	East Siberian Sea
6	Southeast U.S. Continental Shelf	23	Baltic Sea	40	Northeast Australian Shelf	57	Laptev Sea
7	Northeast U.S. Continental Shelf	24	Celtic-Biscay Shelf	41	East-Central Australian Shelf	58	Kara Sea
8	Scotian Shelf	25	Iberian Coastal	42	Southeast Australian Shelf	59	Iceland Shelf
9	Newfoundland-Labrador Shelf	26	Mediterranean Sea	43	Southwest Australian Shelf	60	Faroe Plateau
10	Insular Pacific-Hawaiian	27	Canary Current	44	West-Central Australian Shelf	61	Antarctica
11	Pacific Central-American	28	Guinea Current	45	Northwest Australian Shelf	62	Black Sea
12	Caribbean Sea	29	Benguela Current	46	New Zealand Shelf	63	Hudson Bay
13	Humboldt Current	30	Agulhas Current	47	East China Sea	64	Arctic Ocean
14	Patagonian Shelf	31	Somali Coastal Current	48	Yellow Sea	65	Aleutian Islands
15	South Brazil Shelf	32	Arabian Sea	49	Kuroshio Current	66	Canadian High Arctic
16	East Brazil Shelf	33	Red Sea	50	East Sea		
17	North Brazil Shelf	34	Bay of Bengal	51	Oyashio Current		

Figure S1. a Global map of the 66 Large Marine Ecosystems (LMEs) examined in this study. Red shading indicates the 16 LMEs selected for sensitivity analysis, chosen to provide representative coverage across all major ocean basins while excluding polar regions where persistent data gaps limit reliable evaluation. Numbers correspond to LME identifiers referenced throughout the manuscript. b List of all 66 LMEs with corresponding identifiers.

10

Table S1. Hyperparameter configuration of the CNN model.

Parameter	Value
Convolutional layers	3
Filters per layer	35
Kernel size	3×3
Max pooling layers	2
Pooling size	2×2
FC layer neurons	50
Activation function	GELU
Loss function	MAE
Optimizer	Adagrad
Learning rate	0.005
Batch size	32
Training epochs	135 (early stopping patience = 30)

Table S2. Summary of datasets used for training, validation, and testing.

Dataset	Samples	Description
Training	8013	
CMIP6 piControl	5917	16 models × ~370 yrs each
CMIP6 historical	2096	16 models × ~131 yrs each
Validation	2043	
CMIP6 piControl	1483	16 models × ~93 yrs each
CMIP6 historical	528	16 models × ~33 yrs each
GFDL ECDA reanalysis	32	1965–1997
Test	23	
Satellite Observations	23	1998–2021