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Developing Data-driven models for quantifying Cochlodinium polykrikoides in Coastal Waters

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Harmful algal blooms have been worldwide problems because it leads to serious dangers to human health and aquatic ecosystems. Especially, fish killing red tide blooms by one of dinoflagellate, Cochlodinium polykrikoides (C. polykrikoides), have caused critical damage to mariculture in the Korean coastal waters. In this work, multiple linear regression (MLR), regression tree (RT), and random forest (RF) models were constructed and applied to estimate C. polykrikoides blooms in coastal waters. Five different types of input dataset were carried out to test the performance of three models. To train and validate the three models, observed number of C. polykrikoides cells from National institute of fisheries science (NIFS) and remote sensing reflectance data from Geostationary Ocean Color Imager (GOCI) images for 3 years from 2013 to 2015 were used. The RT model showed the best prediction performance when using 4 bands and 3 band ratios data were used as input data simultaneously. Results obtained from iterative model development with randomly chosen input data indicated that the recognition of patterns in training data caused a variation in prediction performance. This work provided useful tools for reliably estimate the number of C. polykrikoides cells by using reasonable input reflectance dataset in coastal waters. It is expected that the RT model is easily accessed and manipulated by administrators and decision-makers working with coastal waters.