

Using power analysis for monitoring environmental variables: New approaches applied to marine ecology in New Caledonia.

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Abstract: Monitoring ecological variables is mandatory to detect abnormal changes in ecosystems. In population ecology, trends in density, abundance and cover are usually monitored. When the studied variables exceed predefined alert thresholds, management actions may be required. Previously, alert thresholds have rather been defined using expert judgments and descriptive statistics. Recently, approaches based on statistical power have also gained momentum. Here, we present a study which defines alert thresholds for seagrass beds diversity in New Caledonia. Seagrass monitoring is a priority given their vulnerability to natural and anthropogenic disturbances. Using 5 years of reference quadrat data (species cover) on 20 stations around a new mining site, we compared a Percentile Based Approach (PBA) and a sensitivity analysis of power (SAP) to define a suitable monitoring strategy and relevant alert thresholds. Both methods defined statistically relevant alert thresholds, but the SAP approach was more robust to spatial and temporal variability of seagrass cover. Moreover, SAP allows defining sensitivity of threshold values to sampling efforts, and helped improving survey design overall. Using SAP, managers can thus better appreciate the reliability of alert thresholds according to the sampling effort involved in a variety of monitoring context.

References

Van Wynsberge S., Gilbert A., Guillemot N., Payri C., Andréfouët S. (2013) Alert thresholds for monitoring environmental variables: A new approach applied to seagrass beds diversity in New Caledonia. *Marine Pollution Bulletin*, 77: 300-307.