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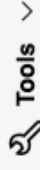
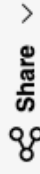
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Using soundscape to monitor population size, demographics, and antipredator behavior in a dense aggregation of colonial seabirds **FREE**

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Migratory seabirds are vulnerable to decline due to climate change and anthropogenic disturbances. Common terns (*Sterna hirundo*) are highly vocal colonial seabirds that serve as bioindicators of their foraging grounds throughout their migratory range. Historically, monitoring colonial seabirds is invasive and time-consuming, and traditional acoustic approaches are complicated by high amounts of call overlap. Monitoring the behavioral ramifications of disturbance, as well as overall colony size and health, is crucial to implementing effective management decisions. However, methods are needed to do so efficiently and with minimal disturbance. In this study, we demonstrate that population size, demographics, and behavior can be assessed acoustically through changes in acoustic energy across varying temporal scales. To do this, we compared acoustic energy to in-person observations of nest density, chick-hatching, and investigator disturbance. We found that trends in acoustic energy align with observations of nest density, and the distribution of acoustic energy across frequency bands is indicative of colony demographics. Furthermore, we found a significant relationship between acoustic energy and investigator disturbance within 20 meters of an acoustic recorder. Overall, our findings suggest that colony-wide trends in population size, demographics, and behavior can be monitored via acoustic energy without the time-consuming analysis of individual calls.