

## Benthic Dinoflagellates, Spinning Fish, and Sawfish Mortalities: Is There a Connection?

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Fish exhibiting erratic behavior (e.g., spinning) and mortalities were observed in the lower Florida Keys in winter 2023 and spring 2024. An examination of water samples did not reveal the presence of any likely stressors (i.e., red tide, low oxygen, pollutants) and red tide toxins (brevetoxins) were not detected in fish tissue samples. The toxigenic benthic dinoflagellate, *Gambierdiscus*, was reported at concentrations of 1,000 cells L<sup>-1</sup>, far above baseline levels measured by the authors over the previous ten years sampling in the Florida Keys (averaging 39 cells L<sup>-1</sup>). With over 50 taxa of fish affected, coupled with the lack of other potential stressors and potentially elevated levels of *Gambierdiscus*, a more extensive survey was undertaken in the lower Keys to determine if a “benthic bloom” of *Gambierdiscus* was occurring in the region. Over one thousand seagrass (*Thalassia testudinum*), macroalgae (*Dictyota*, *Halimeda*, and *Laurencia*), and water samples were collected and examined to quantify *Gambierdiscus* cell densities in addition to other, co-occurring benthic dinoflagellates. A comparison of samples collected in spring 2024 with baseline samples (2011 – 2023) collected elsewhere in the Keys indicated that *Gambierdiscus* cell densities were up to 7 times higher on average at sites exhibiting erratic behavior versus baseline levels. *Gambierdiscus* densities returned to baseline levels in summer 2024 and have remained low since then to present. Working in tandem with toxin analyses of algae, water, and fish samples, the leading hypothesis is that the erratic fish behavior and sawfish mortalities were due (in part) to exposure to toxins produced by elevated densities of *Gambierdiscus*, indicating that a threshold may have been breached, suggesting that a “benthic bloom” of *Gambierdiscus* was achieved, in which acute exposure to the produced toxins elicited the deleterious effects exhibited in the fish. The cause of this bloom remains unknown, although the extreme temperatures in summer 2023 in the region may have been a factor. Research is ongoing to further understand this phenomenon.