

## Upside-down jellyfish as bioindicators of anthropogenic disturbances in coastal ecosystems



Coastal environments are experiencing sea level rise, warming and acidification alongside pollution from upland watersheds, coastal cities, and industrial development. These impacts are global, but solutions and mitigation must be enacted locally, requiring a reliable and straightforward way to monitor impacted areas. Bioindicators can provide essential information to design mitigation and restoration practices.

Upside-down jellies (genus *Cassiopea*) are benthic jellyfish with a semi-sessile lifestyle. They occur circumtropically and are readily

recognizable by fishers, boaters, volunteers, and members of coastal management agencies. Moreover, *Cassiopea* populations react to anthropogenic disturbances, such as dredging and development, and pollutants including herbicides and increased organics associated with aquaculture. The resulting increase or decrease in local *Cassiopea* populations is an easily measurable and reported metric of these human impacts. The time frame of these changes varies but can occur within days to weeks.


Changes in population size and recruitment are monitored bi-monthly over a

10 m × 25 m plot selected a priori, across either transects or random quadrat tosses using a 1 m<sup>2</sup> through the site. Percentage coverage is estimated using a photogrammetric approach where videos and pictures are taken to be analysed after field expeditions to maximize field time.

*Cassiopea* are being used as bioindicators at Jobos Bay National Estuarine Research Reserve (JBNERR), Puerto Rico, which has been subjected to long periods of anthropogenic impact and is threatened by increased tropical storm intensity and changes in rainfall patterns that alter the runoff intensities. The jellyfish blooms occur on the edge of highly impacted areas and shift in and out of lagoonal areas with local changes in water and sediment quality. *Cassiopea* can provide a rapid assessment tool essential to increase local understanding of how past agricultural and waste disposal practices have increased the vulnerability of coastal environments.

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### Competing interests

The author declares no competing interests.

### Additional information

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