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STUDY TITLE: New Invasive Marine Species Colonizing Energy Platforms in the Northern Gulf of Mexico: Verification, and Examination of Spread.

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BACKGROUND: Very few species of scleractinian corals have successfully invaded the Caribbean. A new one has emerged, found on an offshore platform south of the Mississippi River mouth. This Indo-Pacific coral is *Tubastraea micranthus*, and is closely related to *T. coccinaea*, which successfully invaded the Caribbean and Gulf of Mexico and has spread therein over the past 70 years. *T. micranthus* is new to the region and may have the potential to spread like its predecessor.

Accessibility is also important in determining whether an invasive species can be controlled. In the marine environment, depth limits accessibility.

Invasion success by an alien species into a new environment is not only dependent on rate of reproduction, growth rates, mortality rates, or the physical characteristics of the environment; it is also dependent upon the ability to successfully compete with native species for resources. For sessile, epibenthic marine species, one critical resource is space.

OBJECTIVES: We determined whether the populations of *T. micranthus* were spreading throughout the region and whether there was evidence of rapid population expansion. We also compared population density data with that of *T. coccinea*, a congeneric species. Fourteen energy platforms were assessed down to 138 m depth

(max.) by remotely operated vehicle (ROV) using digital video. Colony densities in no./m^2 were determined for both species, and colony size for *T. micranthus.* Data were analyzed by platform and also with respect to geographic distribution.

We also assessed the depth distribution of two Indo-Pacific invasive coral species-*T. micranthus* and *T. coccinea*-on 15 energy platforms using ROVs.

We also examined the competitive abilities of these two invasive Indo-Pacific coral species, *T. micranthus* and *T. coccinea,* on 15 artificial reefs (offshore energy platforms) in the northern Gulf of Mexico, south of the Mississippi River. Underwater videos were taken using an ROV down to 183 m depth on the platforms, and still-capture photos were analyzed from them.

DESCRIPTION: The distribution and abundance of the invasive coral species *T. micranthus* and *T. coccinea* were assessed on 14 platforms in the central region of the Gulf of Mexico, south of the Mississippi River mouth.

SIGNIFICANT CONCLUSIONS AND STUDY RESULTS: *T. micranthus* densities were highest on GI-93C and on GI-116A, SW of the Mississippi River mouth, being significantly higher than most other platforms. Densities declined radially from there. Mean colony size was highest on MC-311A, at the head of the Mississippi Canyon, suggesting this to be the epicenter of colonization. This site is characterized by blue water instead of the turbid, lower salinity water of other sites. This suggests that *T. micranthus* may grow best under blue-water conditions. Size frequency distributions of colonies for *T. micranthus* were skewed towards 1-200 cm^2 –sometimes >90% of the population, indicating populations are in an explosive growth phase. *T. coccinea* densities were high (range: ~50-300/m^2). Its populations were also centered SW of the Mississippi River. *T. micranthus* is spreading through this region and the window for its potential eradication may be rapidly closing.

Pooled data indicated that *T. micranthus* extends to 138 m and probably deeper, while *T. coccinea* is generally limited to $\leq$ 78 m. Average depths for *T. micranthus* were shallower west of the Mississippi River, in its plume, and deeper towards the east. *Tubastraea coccinea* exhibited a similar geographic depth-distribution pattern, but shallower and subtler. Broad geographic patterns were similar, whether using density or percent-cover data as the variable for analysis. When considering individual platforms, *T. micranthus* often reached the bottom and sometimes occurred at depths $\geq$66 m. *Tubastraea coccinea* were limited to shallow water on all platforms. Detailed depth distribution patterns varied significantly between analyses using density and percent-cover as the variable for analysis, with density probably indicating colonization rates, and percent-cover colony growth. Depth limitation by *T. coccinea* may be associated with food availability rather than light since it is azooxanthellate.

Both species were involved widely in competition for space. *T. micranthus* was competitively superior ($\leq$90%) to all competitor species pooled, although frequency of competitive wins varied significantly between platforms. Success was highest in the NE part of the study area, characterized by blue water, and lowest in the SW area near the

river plume, indicating that it may be better adapted to blue-water conditions. *T. coccinea* was also competitively superior to all competitors pooled, with little variability between platform populations and little spatial variation. The two congeneric coral species, when in competition with each other, were equal in their abilities for competitive success, although *T. coccinea* had a slight competitive advantage. *T. coccinea*'s abilities appeared to peak in the SW part of the study area, suggesting that it may be better adapted to surviving in a more turbid, nutrient-rich environment. *T. coccinea* was found to be competitively superior to almost all its competitors, including the encrusting sponge *Xestospongia* sp. (with the commensal *Parazoanthus catenularis*), the light grey encrusting sponge *Dictyonella finicularis*, the black encrusting sponge *Xestopongia carbonaria,* the brown encrusting sponge *Mycale carmigropila*, and the red encrusting sponge *Phorbas amaranthus*. Both *T. micranthus* and *T. coccinea* are formidable competitors for space in the northern Gulf of Mexico.

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