Herbivores play key roles in structuring communities, influencing both the species composition and individual traits of primary producers. In marine systems, herbivore-induced resistance appears to be common in seaweeds and seagrasses, based on pairwise interactions between conspecific and heterospecific herbivores. These scenarios may simplify the interactions that occur in more complex communities, however, providing a limited understanding of the ecological roles of these defenses. For example, multiple herbivores often co-occur on rocky shores, feeding on seaweeds simultaneously. If herbivores act antagonistically or synergistically, whether through direct interactions or induced seaweed traits, net herbivore effects in an assemblage may differ from individual species. Using a series of mesocosm experiments, I examined how herbivore diversity, identity, and abundance affected the strength of herbivore-induced defenses in the brown seaweed *Silvetia compressa*. I also examined whether *Silvetia* populations from Northern and Southern California differed in their sensitivity to herbivore grazing. Overall, I found that *Silvetia*’s induced defenses are highly dependent on the identity and abundance of herbivore species in a community and seaweed population. Thus, these findings emphasize the need for further investigations on how induced defenses vary in space and time in more diverse communities.