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MATX 604
Production and Application Workshop: End-of-Semester Proposal

THREE-DIMENSIONAL VISUALIZATION OF LOOE KEY REEF, FLORIDA KEYS NATIONAL MARINE SANCTUARY

The main thrust of my planned dissertation project, "Last Call for Corals," is to produce a book, modeled on Aldo Leopold's landmark *A Sand County Almanac: And Sketches Here and There*. The planned structure of the book consists of three sections: twelve monthly essays on the life of the reef, a series of essays on selected topics in marine conservation, followed by a final series of ethics arguing for and outlining the basis of an ethical relationship with the terrestrial and aquatic life that surrounds us.

Despite the anticipated eloquence of the words I eventually commit to posterity, the fact is that humans face longstanding challenges in relating with, and sympathizing with, people and other life forms they never see—and never expect to see.

My initial plan was to produce a complementary documentary: to do the filming on dives I will need to undertake during the reporting phase of the project. There are problems with this idea. First, some scholars (such as Bousé 2000) have little faith in the educational value of most wildlife films. More practical considerations apply: VCU faculty member Tim Bajkiewicz (personal communication) and noted wildlife filmaker Chris Palmer (author of *Shooting in the Wild: An Insider's Account of Making Movies in the Animal Kingdom*; personal communication)

agree that my ambitions for that aspect of the dissertation project likely exceed my grasp—at least within the time and funding that will likely be available. Whereas a feature or even a television-length documentary seem out of the question (for now), I anticipate putting together a series of short videos suitable (at least) for viewing online.

Another idea I have considered—which has received some support from VCU faculty member David Golumbia—is what the title of this essay suggests: a three-dimensional visualization of the life of the reef. Such a module could be incorporated into virtual reality platforms such as Second Life or used as interactive exhibits at visitor centers, museums, and aquaria.

The first step in producing such a model involves acquisition or development of a digital bathymetric model (DBM), an underwater analog of the digital elevation model (DEM) used to show aboveground topography in geographic information systems (GIS) and other geospatial applications. In this case, the DBM would show the undersea relief of Looe Key Reef and adjacent portions of the Florida Continental Shelf and Florida Strait. Such data already exist and are available from the National Ocean Survey (NOS), National Oceanic and Atmospheric Administration (NOAA) and have been used to produce small-scale imagery of the region (Finkl et al., 2008). I do not yet know whether the available data are of sufficient resolution to illustrate individual features of Looe Key Reef.

The modeled bottom topography must be populated with marine life. For mobile organisms, simple animation will suffice. But coral reefs are populated with a wild diversity of sessile organisms, including corals, algae, and sponges. Abundant data on Looe Key's life already exists—because of its status as a national marine sanctuary, it has been the subject of numerous surveys in preparation for required environmental impact statements (such as NOAA 1980) as

well as long-term scientific studies and studies of reef restoration and recovery following the running aground of the R/V Columbus Iselin on the reef on August 10, 1994 (NOAA 2006).

As with the DBM data, I doubt there is sufficient base imagery to allow an accurate simulation of the patterns of life on the entire reef. More data will be required. Photo quadrat methodologies have been used on coral reefs for nearly 40 years (Laxton and Stablum 1974). Video survey techniques have likewise been used for more than 15 years (Vogt 1995). Conditions permitting, either one or a combination of both techniques can be used to survey much of the reef, except for possibly the deepest portions of the site, such as a deep ridge at 45 meters depth (NOAA 1980, p. 9)—too deep for recreational (no-decompression) diving. Once the photo/video survey data have been acquired, it can be used to map the patterns of sessile organisms. To be more realistic, animations based on these maps should be done, but unless suitable models for the corals and other organisms are available (and affordable), such animation will likely be beyond the scope of this dissertation.

Ideally, a model of the site will incorporate physical factors, such as changes in the quality and intensity of light with depth and with changing weather conditions and diurnal and seasonal changes in daylength, currents, and weather patterns. Based on my experience with other environmental modeling, this aspect should be easier to incorporate than animations of the life of the reef.

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