

2009

# The Epidemiological Status of PaV1, and the Effects of Infection on Caribbean Spiny Lobster (*Panulirus argus*) Condition, Olfaction, and Predation Risk


Donald C. Behringer

Mark J. Butler IV

Old Dominion University, mbutler@odu.edu

Jeffrey D. Shields

Follow this and additional works at: [https://digitalcommons.odu.edu/biology\\_fac\\_pubs](https://digitalcommons.odu.edu/biology_fac_pubs)

 Part of the [Biology Commons](#), [Marine Biology Commons](#), and the [Oceanography and Atmospheric Sciences and Meteorology Commons](#)

## Repository Citation

Behringer, Donald C.; Butler, Mark J. IV; and Shields, Jeffrey D., "The Epidemiological Status of PaV1, and the Effects of Infection on Caribbean Spiny Lobster (*Panulirus argus*) Condition, Olfaction, and Predation Risk" (2009). *Biological Sciences Faculty Publications*. 58.

[https://digitalcommons.odu.edu/biology\\_fac\\_pubs/58](https://digitalcommons.odu.edu/biology_fac_pubs/58)

## Original Publication Citation

Behringer, D.C., Butler, M.J., & Shields, J.D. (2009). The epidemiological status of PaV1, and the effects of infection on Caribbean spiny lobster (*Panulirus argus*) condition, olfaction, and predation risk [Abstract, 101st Annual Meeting of National Shellfisheries Association]. *Journal of Shellfish Research*, 28(3), 682-682.

**EVALUATION OF HYBRID CLAMS (*M. MERCENARIA* AND *M. CAMPECHIENSIS*) FOR FLORIDA AQUACULTURE: RESULTS OF LABORATORY CHALLENGES.** Shirley M. Baker<sup>1</sup>, Leslie N. Sturmer<sup>1</sup>, and John Scarpa<sup>2</sup>. <sup>1</sup>University of Florida/IFAS, 7922 NW 71st St, Gainesville, FL, 32653, USA; <sup>2</sup>Harbor Branch Oceanographic Institute at Florida Atlantic University, 5600 US North, Ft. Pierce, FL, 34951, USA.

The northern quahogs, *Mercenaria mercenaria*, is an important aquaculture species in the state of Florida. Over the past decade, mortality events resulting from hurricanes, low salinities, and, potentially, high water temperatures, have affected production. The local southern quahog *Mercenaria campechiensis* may offer improved production characteristics and hybridizes readily with the northern hard clam. Therefore, a rigorous examination of parental species and their crosses under laboratory (this study) and commercial conditions has been initiated. Commercial growout size seed (10 mm shell width) of parental species and their crosses, representing two families, were exposed to salinities of 15 or 25 ppt and hypoxic or normoxic dissolved oxygen levels with temperature held constant at 32°C (90°F) for 28 days. Observations of clam mortality were conducted at 24 hour intervals. Survival analyses indicate that *M. mercenaria* x *M. campechiensis* crosses performed better under stressful conditions than did the parental species or the reciprocal cross. In addition, one family performed better than the other family, indicating a genetic basis for future selection processes. Challenges will be repeated for market size clams (25 mm shell width). Supported by USDA Special Research Grant.

**THE EPIDEMIOLOGICAL STATUS OF PAV1, AND THE EFFECTS OF INFECTION ON CARIBBEAN SPINY LOBSTER (*PANULIRUS ARGUS*) CONDITION, OLFACTION, AND PREDATION RISK.** Donald C. Behringer<sup>1</sup>, Mark J. Butler, IV<sup>2</sup>, and Jeffrey D. Shields<sup>3</sup>. <sup>1</sup>University of Florida, 7922 NW 71st Street, Gainesville, FL, 32653, USA; <sup>2</sup>Old Dominion University, Norfolk, VA, 23529, USA; <sup>3</sup>Virginia Institute of Marine Science, P.O. Box 1346, State Road 1208, Gloucester Point, VA, 23062, USA.

PaV1 is the first viral disease known from lobsters, and it alters the behavior and ecology of this species in fundamental ways. Most remarkable is that healthy lobsters, which are normally social, chemically detect and avoid diseased conspecifics. This behavior, along with lethargy in infected lobsters, may break the expected density dependence of infection. We suspected that this lethargy resulted from depletion of metabolic reserves and tested this through field measurements of lobster nutritional condition and found significantly lower hemolymph protein levels among diseased lobsters. Infected lobsters were also less frequently recaptured compared to healthy lobsters in tag-recapture studies, leading us to believe that their lethargy may have exposed them to higher predation rates. We tested this theory using tethered healthy and diseased lobsters and found significantly greater

predation among those infected with PaV1. In turn, we used mesocosms to test whether healthy lobsters, capable of chemically detecting and avoiding disease and predator odors, avoided one mortality risk over the other. When presented with two shelters, one with a diseased lobster and one open, in the presence of a predator (octopus) alarm odor, healthy lobsters will forego the benefits of group defense rather than risk infection with this deadly virus.

**POTENTIAL EFFECTS OF CATASTROPHIC CYANOBACTERIA BLOOMS ON CARIBBEAN SPINY LOBSTER POPULATION DYNAMICS IN FLORIDA BAY USA.** Donald C. Behringer<sup>1</sup> and Mark J. Butler, IV<sup>2</sup>. <sup>1</sup>University of Florida, 7922 NW 71st Street, Gainesville, FL, 32653, USA; <sup>2</sup>Old Dominion University, Norfolk, VA, 23529, USA.

Shallow hard-bottom found in Florida Bay is an ideal nursery habitat for juvenile lobsters. However, this region has been subject to cyanobacteria algae blooms; the most recent in 2007. In many areas covered by the bloom 100% of the shelter-forming sponges that lobster use were eliminated. These sponge die-off events provide a unique natural experiment in which to study the effects of shelter limitation on population dynamics and also provide insight into how habitat-driven changes in population distributions alter disease dynamics. For example, juvenile lobsters are susceptible to a lethal virus (PaV1) which is spread through close contact in this normally social species. However, healthy lobsters detect and avoid cohabitation with infected conspecifics, which reduces transmission. The effectiveness of this behavior has never been tested in a shelter-limited system, where competition for limited shelters might counterbalance disease avoidance. Our results revealed that shelter loss initially increased aggregation but the effect diminished as lobsters dispersed. We also found that in the presence of a diseased lobster, competition ensued and the initial shelter resident was displaced 5x more often compared to trials with two healthy lobsters, but when multiple lobsters vied for shelter, healthy and diseased lobsters co-occupied shelters increasing transmission risk.

**POPULATION GENETICS OF BAY SCALLOPS (*ARGOPECTEN IRRADIANS*): A HISTORY OF LONG-DISTANCE DISPERSAL AND RANGE EXPANSION.** Theresa Bert<sup>1</sup>, Ami Wilbur<sup>2</sup>, William Arnold<sup>1</sup>, and Anne McMillen-Jackson<sup>1</sup>. <sup>1</sup>Florida Fish and Wildlife Conservation Commission, 100 Eighth Ave. SE, St. Petersburg, FL, 33701, USA; <sup>2</sup>University of North Carolina, 601 South College Road, Wilmington, NC, 28403, USA.

Analysis of allozyme data demonstrated that bay scallops in the Florida Gulf have a dynamic population genetic structure that ranges from panmictic to highly subdivided. A core subpopulation exists in northwest Florida waters. Peripheral subpopulations are more genetically variable over time and between locations. Florida