Propanil; Phytoplankton; Zooplankton; Water quality

Aquaculture is the fastest growing agricultural sector worldwide. In the USA, although channel cat sh (*Ictalurus punctatus*) farming remains the major endeavor, other species are also important, such as bait sh, and craw sh. Aquaculture mainly occurs in earthen ponds, which as Boyd and Tucker [1] state are still the most common system.

Phytoplankton are critical to water quality in ponds: in moderate concentrations (250-500 µg/L) they provide dissolved oxygen (DO) and remove nitrogenous wastes which help maintain healthy sh populations [1]. Excessive levels of phytoplankton, however, can result in low DO at night and early morning because they use some of the oxygen they produce for respiration. Phytoplankton die-o can also lead to spikes in unionized ammonia and nitrite levels, and some algae cause o - avors in sh, decreasing their value. In fry ponds, zooplankton is the most important source of food before fry are able to take prepared food. e quality of zooplankton in ponds is very much dependent on phytoplankton dynamics in these ponds.

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pumped into the mesocosms the day of each trial. e four ponds used were gold sh, *L. vannamei* shrimp, hybrid striped bass, and channel cat sh, with industry standard stocking and management, including daily feeding. Water for all ponds was well water of hardness and alkalinity of 100-125 mg/L. Chlorophyll a levels were 1143 µg/L in the gold sh pond, 8 µg/L in the *L. vannamei* pond, 85 µg/L in the hybrid striped pond, and 187 µg/L in the channel cat sh pond.

Morning dissolved oxygen (DO), temperature, and pH were measured using an Aquacheck Water Analyzer. Total ammonia-nitrogen (TAN) using the Nessler method, and nitrite-nitrogen (NO_2-N) were also determined at 0.900 h the day before propanil was added and then at 24, 48, 72 h post application and longer until the mesocosms had recovered from the propanil treatment (judged by no signi cant di erences with the control). Unionized ammonia (UIA) levels were subsequently calculated from pH, temperature, and TAN levels. At similar intervals, phytoplankton and zooplankton samples were taken and analyzed following Perschbacher [2-4]. A two-hour light and dark bottle method was used to determine primary productivity and respiration and chlorophyll a was measured using APHA [6] except for ethanol substitution for acetone solvents.

For all variables, statistical analysis was a one-way ANOVA. LSD tests were used as a mean separation test (0.05 signi cance level) with SAS.

Few di erences in the variables were seen prior to propanil addition. Variables signi cantly di erent prior to propanil addition were not used in results. And although there were some similarities in the e ects of the propanil on the ecosystem variables, the responses of the four pond systems were quite di erent, as will be seen. As noted earlier, only the variables showing signi cant di erences are included in the tables.

e only signi cant di erence was seen in elevated UIA levels a er 24 h (Table 1).

L. vannamei

Signi cantly, depressed di erences in pH were seen beginning at 24 h and extending to 72 h (Table 1). Respiration also was signi cantly di erent, being depressed a er 24 h. And the cyanobacterium *Raphidiopsis* spp. numbers were depressed a er 24 h.

Only zooplankton numbers were found to be depressed from 24 h to 72 h (Table 2). However, only this system exhibited signi cant multiple e ects on zooplankton.

e most signi cant di erences were seen in this system (Table 1). DO was depressed from 24 h to 96 h, nitrite-n concentrations were elevated from 24 h to 72 h. UIA concentrations were depressed from 24 h to 96 h. Chlorophyll *a* levels were elevated from 24 h to 72 h.

e water quality of the pond system with the highest chlorophyll a level (1143 µg/L), the gold sh pond system, was impacted the least. Phytoplankton at high levels has been proposed to modify pesticide e ects by sorption to the algae [7-9]. e most impacted was the channel cat sh pond system, with mid-levels of chlorophyll *a* (187

Ponds should be stocked with fry before application of rice herbicides since propanil can a ect zooplankton numbers, as seen in the hybrid striped bass pond. Fry and ngerling ponds would be especially susceptible to several days of lowered zooplankton.

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