Abstract of thesis entitled

ASSESSMENT OF THE EFFECTS OF AGRICULTURAL PRACTICES ON AMPHIBIAN POPULATIONS IN LONG VALLEY WETLANDS, HONG KONG

Submitted by

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Agricultural practices have altered natural wetland habitats for thousands of years in lowland areas of Southeast Asia, and currently these highly modified wetlands constitute some of the most important remaining habitats for amphibians. However, decreasing area of arable land and increased use of chemicals may affect the persistence of lowland amphibian populations that are now dependent on these habitats. I investigated how amphibians responded to different kinds of farming treatments in a large agricultural wetland in Hong Kong.

In the first part of the study, I assessed the occurrence of breeding amphibians in 53 farming plots in 2010 and 2011. Anuran call surveys were conducted at night at the plots once a week from March to August for two years. Environmental variables were measured and used to develop models to examine species presence, occupancy, and detection probabilities. Wet agricultural plots supported 10 species of amphibians and all had detection probabilities of < 1 that varied seasonally and yearly. Organically managed plots and shallow water plots yielded high species richness and particularly attracted the ornate pygmy frog (*Microhyla fissipes*) and the paddy frog (*Fejervarya*

limnocharis). Air temperature and humidity were the relatively consistent predictors that influenced calling activity of the four most commonly detected species (*M. fissipes*; *F. limnocharis*; brown tree frog *Polypedates megacephalus*; and Günther's frog *Hylarana guentheri*).

For the second part of the study, I assessed the impacts of fertilizers on amphibians. Using mesocosm experiments in the field, I compared the effects of a chemical fertilizer (granular urea) and an organic fertilizer (peanut cake) on the survival and growth of hatchlings of *Polypedates megacephalus*, the marbled pygmy frog (*Microhyla pulchra*), Asian common toad (*Duttaphrynus melanostictus*) and Chinese bullfrog (*Hoplobatrachus rugulosus*). Fertilizers were applied at low, manufacturer-recommended, and high levels, and survival and snout-vent-length were measured after 21 days. No individuals survived in the chemical fertilizer treatment at the recommended application level. Conversely, survival was high for *P. megacephalus* (96%), *M. pulchra* (54%) and *D. melanostictus* (90%), but relatively low for *H. rugulosus* (18%), at the recommended level of the organic fertilizer. *P. megacephalus* and *M. pulchra* tadpoles showed increased growth in elevated concentrations of organic fertilizer. *Polypedates megacephalus* tadpoles were 1.6 times longer in the low concentration and almost double in length in the high concentration treatments. Similarly, increased growth in *M. pulchra* in all organic treatments resulted in abbreviated time to metamorphosis. Chemical fertilizers are clearly detrimental to early life stages of these amphibians, but organic fertilizers may confer benefits including a shorter time to, and larger size at, metamorphosis.

These results suggest that where amphibian conservation is a priority, shifts in the management of wet agricultural crops and limiting the use of chemical fertilizers

may increase the suitability of breeding habitats and survival at early life stages.

(An abstract of 460 words)