The epidemiology and pathology of *Paranannizziopsis australasiensis* in New Zealand reptiles

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Abstract

Paranannizziopsis australasiensis, has recently been diagnosed in tuatara at two captive facilities in New Zealand. This newly emerging fungal pathogen, is a member of the onygenalean fungal group formally known as *Chrysosporium* anamorph of *Nannizziopsis vriesii* (CANV). Fungi of this genera are thought to be obligate primary pathogens in reptiles, and closely related species such as *Ophidiomyces ophiodiicola*, and *Nannizziopsis guarroi* have caused significant morbidity and mortalities in captive and wild reptile populations. The detection of this disease raised concerns for wild and captive population health and resulted in a temporary cessation of tuatara breed and release programmes from affected facilities. Similar lesions have been reported in tuatara at multiple other captive facilities in New Zealand, but lack of veterinary assessment and, until recently, inadequate diagnostic capabilities has led to an inability to confirm the presence or absence of *P. australasiensis* in these populations.

This research aimed to investigate the epidemiology of *P. australasiensis* in New Zealand wild and captive endemic reptiles. Skin samples were collected from nine captive, six wild and two ecosanctuary populations of tuatara across New Zealand. Skin samples from in contact geckos and skinks were opportunistically collected to determine the possible cross species infection of *P. australasiensis*. Samples were tested for presence of *P. australasiensis* by fungal culture followed by PCR, and by loop-mediated isothermal amplification (LAMP). Soil samples were collected from burrows, basking areas and captive enclosures and analysed by LAMP to determine the presence of *P. australasiensis* within the environment.

Paranannizziopsis australasiensis was found to be wide spread in New Zealand captive and wild reptile populations. In populations where the pathogen was detected prevalence varied between 6.7% and 44.4% for tuatara, 3.8% and 40% for geckos and 6.7% and 66.7% for skinks. A low virulence of disease associated with infection was seen in tuatara across New Zealand, with many LAMP positive tuatara being asymptomatic. Increased severity of disease was seen in two captive tuatara, where

other concurrent disease was present. One fatality was reported. In other reptile hosts, no disease was identified, and it is suspected these species act as reservoirs for the transmission of this organism to tuatara. *Paranannizziopsis australasiensis* was detected multiple times in soil samples and may survive as an environmental saprophyte.

Paranannizziopsis australasiensis appears to have a close association with New Zealand reptiles. The prevalence, distribution and pathology of *P. australasiensis* observed in this study suggests that this organism is not a threat to tuatara or other endemic reptile populations in New Zealand. The findings of this study have enabled restrictions placed on tuatara translocations, based on *P. australasiensis* status, to be removed.

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