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A novel virus (order *Bunyavirales*) from stressed redclaw crayfish (*Cherax quadricarinatus*) from farms in northern Australia.

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Highlights:

- NextGen sequencing of the transcriptomes of a farmed, affected & a control crayfish
- The L and M segments of a unique virus called athtabvirus, Order *Bunyavirales* were found
- The L segment was RdRp; M segment had two glycoprotein ORFs in opposite orientations
- Athtabvirus RNA had highest copy numbers (9.4×10^6) in muscle tissue
- Athtabvirus at $\sim 10^6$ copies may be associated with mortalities in crayfish

Abstract

Athtabvirus, a bunya-like virus and chequa iflavirus infect redclaw crayfish (*Cherax quadricarinatus*) and they may cause mortality reaching 20-40% after about three weeks following transportation stress. Lesions were seen in the muscles of broodstock and juveniles and nerve cords of craylings. Using NextGen sequencing, the whole transcriptomes of a farmed case crayfish and a tank-reared, unaffected crayfish were assembled producing over 500,000 contigs. The average depth of reads was 18 replicates with a range from 15 to 44. The near complete sequences of the large and middle genome segments of a bunya-like virus were detected along with chequa iflavirus. The internal bunya-like motifs; RNA-dependent RNA polymerase on the L segment, and glycoprotein n (Gn) on the M segment were easily identified. In the opposite, positive-sense direction on the M segment, another presumed glycoprotein (glycoprotein c) with a low-density lipoprotein receptor (cysteine-rich) motif was identified by position specific iterated (psi)-BLASTp. The athtabvirus was related to Whenzhou Shrimp Virus 2 (E = 0.0, 43% amino acid identity), an unassigned, -ve sense ssRNA virus, and to peribunyaviruses (E = 10^{-50-20}). In descending order of the number of RNA copies/0.2 mg of tissue, the organs most heavily infected were muscle (9.4×10^6), nerve cord (5.24×10^6), heart (4.07×10^6), gills (3.96×10^6), hepatopancreas (1.58×10^6) and antennal gland (6.6×10^5). Given the tissue tropism (muscle and nerves) of athtabvirus and the original lesions, this virus is implicated in being involved in the mortalities in crayfish after transportation.

Keywords: Bunya-like virus, redclaw crayfish, *Cherax quadricarinatus*, stressed, *Bunyavirales*

1. Introduction

In 2014, a new syndrome of mortalities associated with stress was recognised in redclaw crayfish (*Cherax quadricarinatus*) from farms in northern Queensland, Australia (Sakuna et al. 2017a). Crayfish that were stressed by predominantly transportation and translocation, started to die with mortality reaching 20–30% in approximately three weeks and then mortalities waned. Crayfish from one farm had heavier mortalities reaching 40% within three weeks and 65% within 11 weeks.

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