



Research Article

Sequencing and characterisation of complete mitogenome DNA for *Rasbora sarawakensis* (Cypriniformes: Cyprinidae: Rasbora) with phylogenetic consideration

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ABSTRACT

The Blueline Rasbora (*Rasbora sarawakensis*) is a small ray-finned fish categorized under the genus *Rasbora* in the Cyprinidae family. In this study, the complete mitogenome sequence of *R. sarawakensis* was sequenced using four primers targeting overlapping regions. The mitogenome is 16,709 bp in size, accommodating 22 transfer RNA genes, 13 protein-coding genes, two ribosomal RNA genes and a putative control region. Identical gene organisation was detected between this species and other genus counterparts. The heavy strand houses 28 genes while the light strand stores the other nine genes. Most protein-coding genes employ ATG as start codon, excluding COI gene, which utilizes GTG instead. The central conserved sequence blocks (CSB-F, CSB-E and CSB-D), variable sequence blocks (CSB-3, CSB-2 and CSB-1) as well as the terminal associated sequence (TAS) are conserved in the control region. The maximum likelihood phylogenetic tree revealed the divergence of *R. sarawakensis* from the basal region of the *Rasbora* clade, where its evolutionary relationships with *R. maculatus* and *R. pauciperforata* are poorly resolved as indicated by the low bootstrap values. This work acts as stepping-stone towards further molecular evolution and population genetics studies of *Rasbora* genus in future.

1. Introduction

The Sarawak Rasbora or Blueline Rasbora (*Rasbora sarawakensis*) is a member of genus *Rasbora* under the Cyprinidae family. This ray-finned fish species is distinguishable from other *Rasbora* fish counterparts in terms of its unique morphology (having blue longitudinal stripe along its gold coloured body with orange fins) (Brittan, 1951). This fish species can grow up to 5 cm in length, the males are normally the ones with brighter colourations and have smaller bellies as compared to the females (Roberts, 1989). Endemic to Borneo Islands, these Blueline Rasboras can be found abundantly across Batang Kayan, Sungai Sarawak and Indonesia slow-flowing river systems (Brittan, 1951).

The *Rasbora* genus is known as the most species-rich freshwater fish genus with 87 species unravelled as of 2015 (Eschmeyer, 2015). The classification of species within this unique genus was long deemed complicated as these genus members lack inimitable traits, granting them the name, the “catch-all” group (Brittan, 1954; Kottelat and

Vidhayanon, 1993; Siebert and Guiry, 1996; Kottelat, 2005; Liao et al., 2010; Tang et al., 2010). The eight *Rasbora* species complexes in the *Rasbora sensu lato* concept established by Brittan (1954) are highly accepted by researchers from the same field, despite several revisions and new groups (Kottelat and Vidhayanon, 1993; Siebert and Guiry, 1996; Kottelat, 2005; Liao et al., 2010) were introduced and debated controversially over the years. To date, the cryptic diversity of the *Rasbora* genus is still not fully resolved via various morphological (Liao et al., 2010) as well as molecular (Kusuma et al., 2016) methods and even with the combination of both approaches (Aminan et al., 2020).

The *Rasbora* genus is still new and lacking research exposure in genetics and molecular biology. Although this genus has been used in several studies focusing on the mitogenome aspect, only a few researchers attempted to establish the *Rasbora* genus as potential ecotoxicological models (Wijeyaratne and Pathiratne, 2006; Lim et al., 2018). In terms of mitogenome availability in the public Genbank database, a sum of 14 *Rasbora* species (namely *R. maculata*, *R. aprotaenia*,

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